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ENVIRONMENTAL DESIGN AND PUPIL BEHAVIOR: A COMPARISON
OF CLOSED-SPACE AND OPEN-AREA SCHOOLS

by

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A THESIS

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ABSTRACT

This investigation was undertaken in order to fulfill an apparent need for more information concerning the influence of educational environments on the activities of young children. Specifically, with regard to suspected and reported differences between non-western schools and traditional schools. It was also a major purpose of this research to explore the application of a methodology used in the field of study known as environmental psychology. The stated aim of this investigation is to explore the ways in which space design affects human behavior.

The literature reviewed suggested that a strictly objective psychological notion of life observation, known as "behavioral mapping", could be successfully employed. Consequently a system of categorization designed along the three dimensions of behavior, location, and social setting, was developed and used to obtain recordings of the activity of 7 pupils in 12 classes from three non-western schools and three traditional schools within the jurisdiction of the Education Public School Board. A total of 24 hours of observation were made over a period of several weeks. The observations were specially designed from one particular perspective: the child.

Data were analyzed by obtaining counts for various dimensions: location, and social settings. Comparisons were then made between the two school types on the basis of frequency and relative frequency. Three classes of hypotheses were developed and stated: (a) exploratory hypotheses on description, (b) exploratory hypotheses on patterns of activity, and (c) hypotheses from the literature.

Results of the study distinguished the school environments in several

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This investigation was undertaken in order to fulfil an apparent need for more information concerning the influence of educational environments on the activities of pupils, especially with regard to suspected and reported differences between open-area schools and traditional schools. It was also a major purpose of this research to explore the application of a methodology used in the field of study known as environmental psychology. The stated aim of this discipline is to explore the ways in which space design affects human behavior.

The literature reviewed suggested that a strictly objective psychological method of live observation, known as "behavioral mapping", could be successfully employed. Consequently a system of categories organized along the three dimensions of behavior, location, and social setting, was developed and used to obtain recordings of the activity of 72 pupils in 12 classes from three open-area schools and three traditional schools within the jurisdiction of the Edmonton Public School Board. A total of 36 hours of observation were made over a period of several weeks. Two observers using specially designed forms and schedules collected the data.

Data were analyzed by obtaining counts for various behaviors, locations, and social settings. Comparisons were then made between the two school types on the basis of frequency and relative frequency. Three classes of hypotheses were expressed and tested: (a) exploratory hypotheses on categories, (b) exploratory hypotheses on patterns of activity, and (c) hypotheses from the literature.

Results of the study distinguish the school environments in several

ways. Two notable behaviors, reading and writing, were found to be less common in open-areas than in closed classrooms. Social behavior, travel, and housekeeping activities were more frequent in the open-area schools. More locations were used in open-areas, especially libraries, and less time was spent in desks. Interaction between peers was greater in open-space at some expense, apparently, to individual contact with the teacher. Other differences were found, including differences in the patterns of interaction among the three dimensions observed. Some hypotheses from the literature were confirmed, others were contradicted.

Application of this methodology to other questions and other settings is encouraged.

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CHAPTER 1

INTRODUCTION TO THE STUDY

The Problem

The purpose of this study is to examine the activity of elementary school pupils who are taught in either an open-area or a traditional type of classroom in order to determine whether or not behavioral differences exist that could be attributed to changes in the complex variable, space design.

Literature on the open-area school is cited which suggests certain expectations for this innovation. Many of these expectations are tested against the observations reported here.

This research falls within the scope of the general field of study known as environmental psychology. The methodology employed is descriptive and behavioristic. Although architecture and education are disciplines which share the interests of this study, the assumptions and procedures of behavioral psychology predominate.

This investigation is limited to descriptive observation of a number of grade five school children, recording what they are doing, where they are doing it, and who they are doing it with. Teacher behaviors, except as they occasionally intersect socially with a child's activity, are not recorded. Neither are there any measures of attitude, administrative policy, school organization, or scheduling. The only dependent variables are behavior of students, its location, and its social setting. Each of these dimensions is

expressed by a system of categories designed for this research. The only independent variable is the dichotomous one of school design: open-area or traditional classroom.

The question of precisely how a school design operates on pupils is related to the present inquiry but remains nevertheless beyond the scope of this thesis. The problem of paramount interest is this: If changing school design is expected to cause any differences in school behavior, regardless of what hopes we may have for the direction of these differences, and regardless of the specific mechanisms by which such causes may operate, can differences be detected empirically? If so, we may infer that our manipulations have not been ineffectual. It must be left for interested judges to decide if the results are desirable ones or not, and it will be necessary to remember that only circumstantial evidence may have been acquired regarding particular causes.

Data were collected by two observers trained in the use of the codes, schedules, and instruments developed. Frequencies in each category of behavior, location, and social setting were compiled and compared across school types using a chi-square analysis. Many specific questions addressed in this study are discussed on the basis of these comparisons and also on the basis of interaction patterns observed among the three dimensions. The data are presented in tables which hopefully will enable the interested reader to obtain evidence related to an hypothesis of his own, providing that his question can be translated into the dimensions of this study.

Since this research is descriptive, it must demur from offering definite answers to specific questions about the causal functions of

the physical environment in influencing behavior. However, it is assumed that functional relationships, yet to be experimentally discovered or tested, do exist which account for behavioral differences and behavior change. Speculation as to what these relationships might be, is within the compass of this thesis. Hopefully some of the suggested possibilities will lead to further educational and psychological research.

A descriptive study, while not pinpointing causes, may nevertheless allow statistical predictions about behavior to be made, and can thereby establish general principles regarding space usage and design. An investigation such as this may also serve the evaluative function referred to by Hersom and MacKay (1971):

An ongoing program can be examined to see what is happening in terms of its activities and short-term results. One can observe what pupils and teachers are doing, how they use space and other resources, what sorts of interpersonal relations exist, and so on. . . . Continual monitoring of the open-area operation would seem to be an important requirement for planners.

(p. 40)

Hopefully this research will help to prove the usefulness of an empirical behavioral methodology in real-life situations, as well as shed some light on what really happens when children are in schools of different types.

Definitions

The terms used in this study are defined as follows:

Environment: The physical surroundings or contents of a space, not including people. Persons are subsumed within the qualified term, "social environment".

Open-area: An educational environment characterized by the designed absence of permanent interior walls, and normally large enough to include several teaching stations each capable of accomodating a class of normal size.

Open-space: This term is used synonymously with "open-area".

Open-plan: An instructional term indicating a school in which the program and timetable are flexible or open.

Open education: A term referring to an educational philosophy which stresses children's initiative, involvement, and responsibility.

Closed-space: An educational environment characterized by complete enclosure of a single teaching station with permanent walls. Each closed-space classroom is capable of normally accomodating only a single class.

Traditional-space: This term is used synonymously with "closed-space".

Regular-space: This term is used synonymously with "closed-space" and "traditional-space".

On-task behavior: Pupil behavior which is apparently sanctioned by the teacher in particular and the school curriculum in general.

Off-task behavior: Pupil behavior which is apparently not sanctioned by the teacher or the school curriculum. Includes withdrawn or distracted activity and social activity directed toward non-curricular goals.

Social behavior: Pupil behavior characterized by close contact

with another person where the anonymity of a normal class group is overcome.

Definitions of category terms and an expanded discussion of "on-task", "off-task", and "social" are included in Chapter 4.

Organization

Chapter 2 of this thesis is a review of the research and theoretical literature on open-area schools in education, and on environmental psychology in general.

Chapter 3 presents details of the present problem, including specific questions to which the study is addressed.

Chapter 4 deals with the design of the study, including a review and discussion of previous research methods, and a description of the sample, schedule, instruments, procedures, and analysis employed. This chapter also contains an account of how the categories for behavior, location, and social setting were constructed, and provides the particulars of category definitions.

The results of this investigation are reported in Chapter 5 and in the Tables which are placed following Chapter 7. For each of the major dimensions, behavior, location, and social setting, tables include frequencies, percentages, and chi-square comparisons. Observed differences are discussed. Also reviewed are results for two-way interactions among the three dimensions with comments related to the various patterns observed, especially as they differ between school types.

Chapter 6 is devoted to an analysis of the results of this study as they relate to the expectations or conclusions of others who have

examined open-areas theoretically or practically.

Finally, Chapter 7 summarizes the results and states conclusions, implications, and recommendations arising from this work.

All tables appear at the end of the thesis after Chapter 7.

CHAPTER 2

REVIEW OF THE LITERATURE

The proposition that the physical environment is a factor which influences human behavior hardly requires defense. From lighting a fire to turning on an electric bulb, or walking on grass to negotiating a freeway exit, we find evidence that man adapts to, and makes modifications upon, his surroundings. Indeed, all life has in common the need to cope with the environmental exigencies of survival, but for humans alone has management of the world become a highly developed art and science. More interesting than this truism, however, are specific questions of how man is master or slave of his settings. How, for example, does the amount of arable land affect the cultural development of a region, or how does pavement control the play behavior of children?

Particular problems may be critically important to human welfare or global ecology, or may be quite trivial in scope. Environmental stimuli can be as grossly obvious as a range of mountains or the Oakland Bay Bridge, or as subtle as a slight change of color or the precise placement of stereo speakers. Similarly, man's responses to his physical setting may be radical--tunneling through the mountains, or jumping off the bridge--or they may be as delicate as searching out the best angle for a panoramic photograph of the Oakland Bay.

The causal relationships between many environmental stimuli and human responses are not precisely known. It cannot even be counted on that the most apparent stimuli necessarily elicit the most powerful

responses, or that subtle stimuli cause subtle effects. Also, it is important to recognize that individuals and groups have frequently adapted to their surroundings without much rational understanding, or even awareness, of the process. When one does recognize that a particular environmental stimulus has a bearing on his behavior, or the behavior of others, it is often tempting to jump to conclusions about the relationship involved that may be intuitively appealing but not stand the test of empirical verification.

It is for this reason that psychology may see as its legitimate province the scientific investigation of the effects of the physical environment on human activity. The artistic, technical, or common-sense approach often employed by the architect, urban designer, or interior designer, or the administrative orientation of the organizational analyst, contribute some theory and much practical accomplishment in the planning of space. But a psychological method seems to be uniquely suited to some aspects of such problems since it attempts to deal objectively with human behavior and all of its determinants. The contribution to be made by psychologists could be extremely valuable. To assist in design analysis and problem solving is one of the purposes of environmental psychology.

Environmental psychology as currently practised lacks sufficiently clear boundaries to permit the ready organization of its literature into categories that would allow exposition from general to specific topics. Consequently this review will develop relevant themes beginning with a discussion of educational environments. Items of interest that are primarily related to the actual design of the present research will be reserved for Chapter 4.

Education

Educators' interest in environmental psychology has been of a specific and practical nature--how to build better schools and classrooms. Contributions from education to the theory and practice of school architecture have mainly come from two sources: early childhood education, and the innovation in school design known commonly as the open-area school. Suggestions and practice in both of these areas have fortunately been accompanied in most cases by various rationales which attempted to make the recommendations credible in a philosophical sense, by relating them to a philosophy of education and the goals associated with it, and credible in a practical sense by at least attempting to describe the specifics of how a design innovation could be implemented and how it would actually work to facilitate the stated goals.

Early Childhood Education

Many early childhood educators seem to have taken as their philosophical justification for altering space design, two main propositions: that children can indeed learn in relatively unstructured settings, without a great deal of specific lesson planning, scheduling, or presentation by a teacher (Almy, 1966); and that learning should be child-centered or individualized so that a child's specific curriculum is largely unique to himself (Mukerji, 1965). Combining these two statements the corollary is advanced that this unique curriculum should be determined to some extent at least by the child himself in interaction with his environment. In a word, it is asserted that play is important. The above reasoning rests in turn

on a set of beliefs about the innate curiosity of children, about the role of adults, and about a sequence of developmental stages through which children may pass with different sorts of help than have traditionally been considered necessary (Almy, 1966; Ellis, 1967).

Generally stated, the practical goals derived from this philosophy include: for increased learning activity of all kinds to occur, in a greater variety of settings, with less teacher control, more manipulation of materials, fewer tears, more laughter, less aggression, more child-child interaction, more single child with teacher interaction, and less teacher presentation to large groups. (Berson & Chase, 1966; Widmer, 1967). It will be seen that many expectations for open-area schools can be identically stated, but with slightly different rationales behind them.

Two basic environmental innovations have been proposed and employed to facilitate these aims for young children. These are the "learning-center" approach to designing and furnishing an early childhood setting, and the "adventure playground". Changes in teaching style are recommended to accompany these spatial alterations.

The learning-center design is quite simple to understand conceptually, though it may be complex in terms of implementation. Basically the approach is analogous to offering a diner a buffet, rather than a sit-down meal with a pre-set menu, served in a standard sequence. No gross environmental changes are necessarily required; that is, the general design of a room as far as the location of permanent fixtures such as walls is concerned, usually need not be tampered with. The modifications required are of the interior design by placement of furniture and learning materials. Rather than have the entire room be

one major learning space to which materials, and the teacher, and all the children, are delivered then removed after a certain period of time, learning-center advocates suggest that almost all materials be left in the room, in particular locations (the centers) and be available to any child or small group of children. The only other requirement is that scheduling of activity be modified so that more than one of these now accessible options be open to a particular child at a given time (Billings, 1970). This demand, that design innovation be accompanied by timetable changes, is a general one. It is a way of saying that a changed environment necessitates (or causes) changes in our organizational behaviors.

Of course, many variations on these general design principles are possible. It may be that outdoor areas or a gym can be incorporated as centers; rooms may have two or twenty centers; centers may be simple or complex; the degree of supervision necessary may vary from spot to spot; scheduling may restrict use of the centers to part of a day only; some centers may change day by day, others may be permanent. Also, different layouts may yield different traffic patterns or "moods" may be influenced by cosmetic alterations. Since the learning-center layout may be rearranged by sections, the system as a whole has somewhat more flexibility than the single-space room.

This design does not, by itself, cause all of the behaviors seen as desirable for young children. What it ostensibly does do, is facilitate those activities while it simultaneously discourages others. (The common terms "facilitate" and "discourage" are recognized as often analogous to "reinforce" and "extinguish" in behavioral science.) For example, it is usually the case that once learning centers have been

established, it may become quite difficult to find physical space where groups of more than a few children can congregate, unless an area has been specifically retained for this purpose. Also, what may be called the "demand qualities" of learning centers affect the youngsters. Like the mountain which "cries out" to be climbed, the displayed materials cry out for use. Psychologically we might say that more novel and various stimuli become salient. Indeed, part of the art and science of designing a kindergarten or playschool is to make the centers attractive, in quite a literal sense, so that children will seek and discover these play spaces with a minimum of teacher prodding. This same attractiveness is also an obstacle to implementing any less appealing, more structured activities that the supervisor may consider.

A layout with many centers usually appears to encourage the behavior of moving from place to place with extended intermissions for play. Perhaps it is relief from the boredom of staying put too long that is the reinforcement in this case. Maze-type plans inhibit running behavior because of the shortness of paths and the presence of centers acting as barriers.

Exacting tests have not been done to prove all of the claims made for the learning-center approach, but casual observation and professional use lead to the tentative conclusion that this method does represent a positive step in improving class design, and in fulfilling the philosophical and practical goals as described above.

The second environmental innovation championed by some educators of young and not-so-young children is the adventure playground. Philosophical rationales for these efforts are similar to those presented earlier, but with a greater leaning toward the extremes of

the positions represented. Adventure playgrounds may be highly unstructured and highly unsupervised. They are an apparent attempt to recreate the vanishing vacant lot or neighborhood ravine where children once could retreat to simultaneously escape adult scrutiny and engage in adventurous activities such as building treehouses, hunting for fascinating or useful junk, and generally behaving as natural children. However, this "natural" may be more based on adult nostalgia than on the real needs of today's child. Adventure playgrounds are generally conceived of as highly manipulatable, which is to say that materials and structures in the area can be carried, shaped, taken apart, assembled and so on. They are also very disorganized and in "delightful chaos" as Polly Hill (1970) terms it.

Specific goals and expected behaviors include: engaging in various sorts of manipulative play; socializing with children much more than with adults; running; laughing; and even some crying, since "natural" bumps and bruises are apparently viewed as unavoidable. A more complete list of aims is difficult to compose since the very intent of the environment is that children "do their own thing".

Once again there is an emphasis on the demand qualities of the surroundings--"adventure!" playground. It is suggested that unstructured, even junky or wild, spaces appeal to children in a way that differs from the usual adult response. Some operative reinforcers might be opportunities to play with unusual materials, social interaction with other youngsters, construction of a useful or interesting edifice or toy, or freedom from the possibly aversive stimulus of adult supervision.

Modifications upon this basic design are also possible, and

depending on one's philosophy (or concern for children), desirable. There may be added supervision if adults regard completely free play in such an environment as too dangerous. Natural materials or structures may be supplemented with supplied equipment, though the requirements that such additions be attractive and manipulatable still apply.

Hard evidence that this or that behavior actually predominates in adventure playgrounds is lacking. Comments and evaluations are usually based on informal observation and consensus. Judging from the lack of popularity of these areas, the consensus is apparently not all that positive.

Open-area Schools

The open-area school represents an attempt to alter radically the form and size of classrooms, and thereby to facilitate changes in the internal structure and furnishing of educational spaces. The primary design innovation is the removal of interior walls to create a large open-space with equivalent square footage but without permanent physical barriers. The simple immediate results of this variation logically follow. Uninterrupted expanses of floor may be more easily traversed by people or sensory stimulation, and may be temporarily built upon in a greater variety of ways.

The simplest open-areas are square or rectangular, although hexagonal, octagonal, circular, or even spiral structures have been built. Bumbarger (1972) identifies two principal styles of open-space. One is a series of grouped spaces including some barriers where class units are separately located; the other is an arrangement employing a loft above the open-space, which is left as unobstructed as possible.

The loft often houses the library or is reserved for individual study. Carpet, drapes, and acoustic tiling and ceiling are normally employed to absorb noise.

Though the open-area initially possesses more flexibility due to the absence of restricting walls, this adaptability is of a physical nature only. While it is obvious that space without barriers is easier to build within or furnish than one where barriers must be contended with, it does not automatically follow that behavioral or organizational flexibility will increase. The simplest examples serve to refute such a notion. A child in a room with a shelf of toys has his mobility slightly impeded, but has at his disposal a variety of stimuli and responses not available to a child in an identical room left bare of that essential furnishing. Similarly, the behaviors of seeking privacy are more various and stand a much better chance of being rewarded in an area with at least one partial internal wall, than in an entirely open space. Since many of the reasons behind design and construction of open-area schools are based upon this notion of flexibility, the distinction between physical and behavioral adaptability is an important one.

Eberle (1969) summarizes the philosophical rationale for open-area schools as emphasis on individuality, flexibility, and adaptability which results in the development of attitudes, beliefs, values, and behaviors supportive of the open society. Apparently an open society may depend upon open-education which is best implemented through open-plan teaching that finally is facilitated by an open-area school environment. Thus the importance of design is recognized not only for its influence on schooling activities, but for its long-term effect

on societal growth and change. In general there is a philosophical emphasis on meeting the needs of individual pupils, increasing access to learning, and rewarding self-expression, creativity, and inventiveness (Hersom and MacKay, 1971; Brunetti, 1971).

It is recognized that open-areas will make novel demands upon staff, especially in terms of co-operation with one another, and in realizing the potentialities of the new design.

As extracted from recent literature, some expected practical outcomes of a change to open-space schools are the following: variations in class sizes; more individualized instruction; use of a greater variety of learning materials and instructional approaches; more staff interaction and cooperation; increased teacher interaction with individual pupils or small groups; more contact between pupils; better access to media and the library; experimentation with space and the formation of various sized sub-areas for different sized groups; more freedom and variety of student behavior and self-expression; flexible scheduling; use of contract learning; increased involvement of parents and visitors without disturbance; team-teaching or teachers "sharing" classes; less misbehavior or boredom; more movement; use of a learning-center approach; increased involvement of pupils in the planning of learning; and reduced fear of failure and better personal development of students (Anderson, 1970; Brunetti, 1971; Drew, 1970; Eberle, 1969; EFL, 1969; Ellison, Gilbert, & Ratsoy, 1969; Hersom, 1971; Hersom & MacKay, 1971; Ingalls, 1969, Shaw, 1971).

There has also been discussion of possible disadvantages to open-areas. Drew (1970) summarized doubts and criticisms from many sources. He mentions particularly: more noise in open-space; higher anxiety

and difficulty adapting; increased time needed for planning and co-ordinating; excessive visual stimulation; lack of facility, speed, and mobility; less freedom due to scheduling problems; need for adjunct spaces; loss of privacy and security; spatial monotony; and inappropriate scale of the setting. The concept of physical flexibility also comes under attack, especially from Prangnell (1969):

"Flexible" buildings are conceived with a precision of efficiency that is humiliating. Their authors seem to be possessed by a single mindedness of purpose that has blinded them to real issues. Their vision of a building responding to the changing needs of its inhabitants is too cumbersome. . . . We will realize that "getting things done" in any one school building takes months of preparation. In fact, to move standard movable partitions requires the same administrative effort as that required to move a conventional block and plaster wall. . . . Real flexibility comes only through the possibility of immediate change. We can achieve immediate change not by altering a room but by altering our relationship to it. Often it will be to move to another more convenient place and the extraordinary mobility we have serves this idea.

(p. 39)

Several recent studies have addressed themselves to the problem of describing or evaluating the performance of open-space schools. Allen (1972) found that formal instruction in large groups was less popular in open-areas, though he reports a strong emphasis on traditional

subject areas. Ability grouping was found to be common in language arts and mathematics. More interaction of teachers with students and between students was also noted.

Carbonari (1971) discovered children in an open-area to be more independent, lively, self-reliant, extroverted, and anxious.

Burnham (1970) reported a trend for more pupil initiated activity, more co-operative planning, greater personal responsibility of students, and more pupil questions to be observed in open-space schools.

Chapman (1970) noted no differences in verbal or non-verbal behavior of children, and less use of peripheral space in an open-area compared to a traditional class.

Johnson (1970) indicates that many more small groups were used in an open-space school with greater flexibility and more frequent regrouping. He also reports more time spent in independent study, less time in teacher directed activities, more time travelling, increased interaction between students, and greater time spent with individual students by the teacher.

Cheek (1970) found frequent communication between students, and different teacher roles and principal roles in open-areas. He suggests that positive relating between teachers and pupils may be facilitated.

Ellison, Gilbert, and Ratsoy (1969) report that more time is spent on routines in a traditional classroom. In the open-space, more time is spent observing other teachers, interacting with adults, and in transition. No differences were found in instructional supervision or in methods of presenting information. They also noted more large-group activity in open-area, more teacher presentation to large groups, less private talk between teacher and pupil, and an

increase in talk initiated by students.

Kaelin (1970) found that in open-space schools children have more opportunity to associate with peers and talk socially as they work. He also mentions that ability grouping is not prevalent, opportunities for independent work exist, transfer of children between teachers is facilitated, and children can find added opportunities to relate to adults.

MacPherson (1972) discovered more freedom of movement in open-areas, more team teaching and student co-operative activity, and less pupil time spent in an individual desk.

A report of the Halton County Board of Education (1969) found better attitudes of pupils toward school and themselves, and fewer discipline problems in open-space settings. Also noted were freedom of movement, more noise and distractions, and students who mentioned wasting time.

A report of the Sudbury Board of Education (1972) states that there was no difference in the amount of interaction between children and teachers. Open-area pupils worked more frequently in groups, but there was greater verbal interaction between pairs of students in regular-space schools. No difference was found in the use of audio-visual equipment or printed matter. Achievement was claimed to be better in open-area although reading ability was found to be the same. Interestingly, the greatest agreement with the philosophy of the "open concept school" was expressed by teachers of the traditional classes.

In summary, the results of research into open-area schools are inconclusive and often contradictory. It seems that in some cases many of the expectations have been realized to an extent. In others, it is

difficult to find any apparent change or advantage over a regular-space design. Many open-areas have arranged their space in quite rigid, traditional ways, and new schools being built often compromise by including an open-space and supplemental wings of ordinary classrooms. The open-area school has certainly not been embraced as the last word in school design.

Environmental Psychology

Many disciplines have contributed to the theory and practice of space design. Education has played the roles of originator and recipient of new innovations at various times. Schools have also been favorite subjects of inquiry for many persons involved in investigating environmental variables. This section discusses first, research, and then theory of the general field of study called environmental psychology, and the relationship of this research and theory to the problem of school construction. Environmental psychology is at present an eclectic discipline, drawing its knowledge from widely diverse sources: architecture, social psychology, interior design, engineering, sociology, anthropology, geography, urban design, and management, as well as education. The outcome of assembling many often dissimilar points of view or experimental results is not a neatly organized package, but it does represent an important attempt to bring unity of content and method to an important class of variables bearing directly on human welfare.

Research

Maslow and Mintz (1956) found that judgments of psychological

states, such as weary, zestful, or irritated, based on photographed faces, differed in three physically different rooms. Also, ugly surroundings elicited reactions of avoidance, fatigue, discomfort, boredom, and irritability. It has long been recognized, at least intuitively, that the cosmetic appearance of classrooms can affect mood and motivation of pupils or teachers. Making explicit just what these effects are, would allow enlightened creation of intentionally "moody" spaces. Stansfield (1973) makes the case that a school should provide a variety of areas that are appropriate to different student personalities. However, as yet no adequate typology of such variables has been created, and it should be stressed that environment not only accommodates attitude, it shapes it.

Porter and Lawler (1965) identified seven dimensions of organizational structure that related to attitude and behavior. They further noted that compatibility of organization and physical lay-out was in itself a powerful factor. In the case of schools, one would expect differences in informal organization at least, when space is open and areas and children must be shared. In closed spaces the authority of a single teacher predominates. Users of open space must learn new organizational roles as part of learning to use the new design.

Schoggen (1963) defined an environmental force unit (EFU) as any action by an environmental agent that occurs with a child and is directed toward a recognizable end state with respect to the child. Schoggen looked at different types of behavior settings and found different types and amounts of EFU's. Unfortunately, however, a useful typology of these stimuli has not been developed, so the results of this work are difficult to generalize. Nevertheless, a functional

analysis of the sort apparently proposed by Schoggen deserves further elaboration.

Endler and Hunt (1968) investigated hostility and discovered that differences in setting accounted for differences in hostile behavior. A specific application to school settings might permit clarification of the role of walls, for example, in inhibiting or encouraging aggressive activity.

Leiderman and Shapiro (1964) found that environmental variables were related to health and illness. Not only gross variables such as climate or community housing conditions were implicated, but subtler factors of an architectural nature, such as those that determine relative amount of activity, were slightly relevant.

Griffiths and Langdon (1968) found that simple measures of noise level were not sufficient to predict dissatisfaction. Some measure of the amount of fluctuation of noise level was also necessary. Apparently open-area schools where noise is a problem cannot obtain relief solely by reducing it, but must direct efforts at stabilizing it as well. Some diffusion and stabilization of sound may occur spontaneously in large spaces.

Sommer (1969) has discovered, as Hall (1966) had suggested, that consistent interpersonal distances exist in a variety of situations. Altman (1971) has shown that the way in which space can be used will facilitate or hinder interaction in terms of these interpersonal distances. Open-areas probably influence changes in these distances and thus have predictable effects on social activity.

Parr (1965) has suggested some possible lines of basic research into psychosomatic fatigue and its environmental contingencies such as

travel patterns, perceptual paucity or abundance, visual obstacles, and other factors. Many of these contingencies operate in open-space schools and may account for changes in boredom or weariness.

According to Moos (1973) studies of the effects of population density have mostly been done with animals, but there are apparent potential applications to human environments. Crowding in animals has been shown to affect reproduction, aggression, drug toxicity, adrenocortical functions, blood pressure, and immune responses. If open-areas result in lower densities there may be behavioral and physiological benefits attached.

Holland (1966) proposed six model environments characteristic of common physical and social settings in our culture, and six corresponding personality orientations identified by an individual's vocation. These six labels, realistic, intellectual, social, conventional, enterprising, and artistic, permit classification of people and environments in the same terms. Moos implies that there are promising approaches to assessing the effects of various degrees of congruence between persons and settings. Stansfield's suggestions, mentioned earlier, to have learning areas suited to a variety of personalities, might be supported by results in this area.

Srivastava and Good (1968) studied three architecturally different psychiatric treatment environments and obtained support for the hypothesis that group interaction would differ among the settings. They suggest that interpersonal contact is rather static in private or passive spaces, but that group composition changes more frequently in public and active spaces. Congregations tended to form around windows and low partitions. They concluded that the degree of design

complexity was positively related to the amount of interaction in medium-size groups. The expectation that changes in school design will affect pupil relationships is probably a reasonable one.

Black (1950) investigated the effects of room size and acoustic qualities on verbal behavior and found that both intensity and rate of vocalization were influenced. It may be important not only to subdue sound in open-spaces with carpeting, but to analyze carefully the subtler variables that acoustics may alter.

Birren (1965) cites evidence that human reactions are 12% faster than average under red lighting conditions, while green lights appeared to generate slower than normal responses. Colored lighting seems to affect judgments of time, length, and weight. Goldstein (1942) reported that under red illumination these judgments tended to be overestimates, while green or blue yielded frequent underestimates. Harmon (1944) suggested that mental and visual task performance may be facilitated by soft and deep colors in the environment. Perhaps for special learning situations, the use of color as an aid could be explored. Certainly it would be expected that creation of an attractive environment must take account of color as a vital dimension of aesthetics.

Sommer (1959) found that corner seating at tables generated more personal interaction than arrangements where subjects opposed one another or sat beside each other. Sommer and Ross (1958) doubled the frequency of patient conversations by experimental manipulation of furniture on a geriatric ward. Certainly seating is an important factor in education, but it is doubtful if most groupings are based on considerations other than convenience and a desire to focus attention on a teacher at the front of a class. If there are ever situations

where a different organization is desirable, it is cumbersome and time consuming to move desks. Use of more adaptable alternatives such as tables and chairs is probably to be recommended.

Karmel (1965) found that students in windowless classrooms drew schools with more windows than did pupils in schools having windows. After analyzing these drawings, he concluded that the windowless environment included more unhappy children. Myers, Johnson, and Smith (1968) did not confirm these results. They report that subjects showed no unusual responses during confinement in a windowless cubicle when other stimuli were left intact.

Theory

The essential differences among theoretical approaches in environmental psychology involve many of the same arguments and distinctions that characterize psychological theories in general. Typically debate revolves around several viewpoints such as how much a theory should allow of subjectivism, whether it is idealistic or materialistic, and to what extent it is deterministic. Other important questions relate to the extent to which a theory considers the physiological activities of an organism important, the degree to which it is structural or functional in its approach to description and problem solving, and the amount of leeway to be permitted in the use of hypothetical constructs.

The metascientific axioms or conclusions of many theorists and researchers may differ considerably, but it is possible to sort the variety of positions represented into three principal groups which will be labelled and discussed below as phenomenological, behavioral, and

eclectic.

Phenomenological approaches admit the usefulness of subjective data such as that given by introspection. The orientation is idealistic and emphasizes perceptual, cognitive, and affective structure and organization. Phenomenological doctrines may recognize physiological correlates to internal experience, but stop short of suggesting an identity between mental states and the biological activity of the organism. This point of view is usually tolerant of the use of hypothetical constructs in theoretical development.

In environmental psychology, phenomenology underlies the formulations of Koffka (1935) and Lewin (1951). Koffka spoke of the "behavioral environment" and developed a theory within the Gestaltist perceptual framework, of the role of the environment as experienced. Lewin's field theory and conception of "life-space" offers a second alternative. One may include environmental factors in the topography of the life-space and somehow associate with them the appropriate vectors and valences that will contribute to determining resultant behavior.

Stern (1970), in developing Murray's (1938) need-press theory, stated that environmental press provides the external counterpart of personality needs. He divides press into anabolic press, which is conducive to self-enhancing growth or mastery, and catabolic press which is antagonistic to personal development. This formulation appears to parallel Lewin's approach.

A phenomenological orientation is characteristic of Barker's (1968) conceptualization of "behavior settings". He makes a distinction between behavior and the objects of behavior, and he distinguishes in phenomenological terms the subject from the environment in which he acts.

Behavior settings, according to Barker, have great coercive power over what occurs within them. He also presents a methodology for identification and categorization of these settings. Barker and Gump (1964) have done research in the realm of school design. They found that students in smaller schools, with relatively few associates in the behavior setting, report more pressure on themselves to participate in school programs and to perform in more responsible positions. These pupils also claim to have more satisfactions related to the development of competence, to being challenged, to engaging in important actions, to being involved in group activities, and to gaining moral and cultural values.

One practical disadvantage inherent in the phenomenological approach as outlined above seems particularly important to note. This is the apparent necessity of discussing behavior as mediated by the perceptions and deliberations of the subject. Though this does not deny the effects of environment on activity, it does insert a gap into the causal process. One is not able to ask the direct question, "Does this factor contribute as a cause of the behavior?" One must first ask, "Does this factor influence the subject's experience?" and then, "Does this experience have a bearing upon the behavior?" The difficulty of this position is that while it is possible to verify empirically the existence and nature of the stimulus environment, the analysis of inner experience poses special problems.

A more direct approach to understanding the effects of environment on activity is offered by behaviorism. The behavioral point of view is that causal connections can be discovered between stimuli and responses without reference to anything other than observable or

potentially observable entities and processes. It is also recognized that behavior has consequences which themselves become stimuli for following responses. Thus the interaction of subject and environment may be seen as a dynamic process, all elements of which are accessible to an investigator equipped with the necessary techniques and tools. Being objective and empirical, and scientifically materialistic, descriptive and explanatory power is high. The discovery of functional relationships (causal dependencies) is stressed and the use of hypothetical constructs or reference to internal physiological processes is rigorously controlled by scientific rules and principles.

One example of applying a behavioral approach is the work of Schoggen (1963) who developed categories for environmental classification from naturalistic observations. He conceptualized and defined environmental force units (EFU's) as actions by an environmental agent that occurred with or toward a subject and were directed toward a recognizable end state with respect to the subject. His work with children indicated that EFU's occurred frequently, came from mothers more often than fathers, and differed in type and amount in varied behavior settings where presumably different shaping processes were operating. Also, wide individual variations were found between children in the percentage of EFU's initiated toward and received by them. Schoggen also identified conflict EFU's in which an agent's goal for a child was different from the child's apparent goal.

Since EFU's presume to identify the types of behaviors likely to be positively and negatively reinforced, and to discover the directions in which behavior change will occur, this qualifies as an attempt to analyze settings functionally.

Bales (1950, 1970) has developed a system of classification for the activities of persons in small groups. Trained neutral observers code the behavior of participants in one of 12 categories, taking account of both vocal and non-vocal components of each act. The 12 codes employed apply to six sorts of group problems: (a) integration (shows solidarity or shows antagonism), (b) tension management (shows tension or releases tension), (c) decision (shows agreement or shows disagreement), (d) control (makes suggestions or asks for suggestions), (e) evaluation (gives opinion or asks for opinion), and (f) information (gives information or asks for information). The first three sorts of problem listed above are classed as socio-emotional and are each subdivided into positive or negative. The final three sets of codes shown above are called task oriented and are each subdivided into offering or asking for a response.

Applying this system of observations results in an empirical representation of the group interaction process. The relationships of group members to one another, the changes in these relationships, and the changes in orientation of the group can thus be investigated. While not explicitly designed for the discovery of environmental influences, potential applications in this regard may be considered. Group dynamics may be analyzed in different settings in a detailed manner and variations in content or process discovered. It appears quite feasible even to include selected physical objects as part of the group and code their roles in the interaction. A particular arrangement of chairs, for example, may contribute to solidarity or antagonism or to tension management (cf. Sommer, 1959). Possible contributions of suggestions or information may be made by pictures

or posters that are part of the setting. The control exercised by walls or furniture could conceivably be recorded in a new or expanded category. While some modifications would probably be necessary, the goal of being able to observe simultaneously the roles of both animate participants and inanimate elements of the group in the same terms does not seem too far fetched.

The method of Bales is limited to the structural analysis of groups and to recording changes in that structure. No method for specifically testing causal relationships is included in the model, although inferential conclusions may be drawn. A functionally oriented paradigm does exist, however, based on the work of Skinner (1957) and Bales.

Skinner's model for verbal behavior is an application of previous developments in the investigation of contingencies of reinforcement. He suggests a classification system for verbalizations which employs the categories: mand, tact, extended tact, intraverbal, textual, echoic, and autoclitic. Characterization of behavior in each of these classes is based upon recognition of stimuli or reinforcers which control the response. For example, the mand is an expression whose consequence normally is a particular response, as when the command, "Sit down", is followed by sitting down. The tact is an utterance whose referent is to be found in the here and now setting, as when the statement, "This is a chair," indicates a physically present chair. The other categories are similarly defined according to their particular functional connections to other vocal behavior or to non-vocal stimuli and reinforcers.

As McLeish and Martin (1975) point out, what Skinner calls "verbal

behavior" is not merely vocal. Gross and subtle motor behaviors form an important component of any verbal response. They also suggest that social behavior in general may be investigated by the same methods of analysis. Drawing also on the work of Bales, McLeish and Martin developed a ten category classification system for social behavior and successfully applied it in a functional analysis of learning group processes. This system employed the Skinnerian labels, mand, tact, extended tact, echoic, and intraverbal, and a modified set of codes for autoclitics which included dominant and submissive control autoclitics, positive and negative affective autoclitics, and informative autoclitics. It tapped control, information, and affect dimensions of activity, and permitted the discovery of causal behavior sequences made up of discriminating stimuli, responses, and positive or negative reinforcements.

Application of this model to an analysis of environmental influences seems to be a highly promising logical extension of the work already done. Many physical contingencies are already noted in coding tacts and extended tacts. It appears to be quite possible to incorporate further environmental variables especially into the categories of dominant and submissive control. This would permit detailed experiments to be conducted to evaluate in a rigorous fashion the actual contributions of walls, windows, furnishings, objects, lighting, climate, and so on to the living behavior of people. Appeal to reports of subjective experience would be unnecessary.

A variety of eclectic positions can also be found in the theory of environmental psychology. In general a point of view qualifies for inclusion in this class if the metascientific assumptions underlying it

are unarticulated, unclear, or considered unimportant. These approaches tend to emphasize objectivity but tolerate idealism, and tend to be as concerned with structuralism in a phenomenological sense as they are with functionalism behaviorally. A willingness to use material from any source if it appears useful is often evident, and scathing criticism is rare. The range of orientations available is diverse.

Proshansky, Ittelson, and Rivlin (1970) have attempted to compromise the behavioral and phenomenological positions to overcome what they perceive as deficiencies in each. While such a compromise may seem undesirable if not impossible, their effort deserves attention because it points out many principles worthy of consideration in environmental psychology. Following is an edited summary of a set of assumptions according to Proshansky, Ittelson, and Rivlin for which there appears to be wide acceptance by researchers of any ilk:

1. The physical setting that defines and structures any concrete situation is an open system.
2. The environment is unique at any given time and place.
3. Behavior in a physical setting is dynamically organized and changes in behavior can be induced by changing physical or social structures that define the setting.
4. Every component of an environment has a reciprocal relationship with every other component and the setting as a whole.
5. The surroundings of a particular participant are unique to his point of view.
6. Although a participant may remain largely unaware of his surroundings, they will continue to influence his behavior.

In summary, it appears that the development of environmental

psychology, and consequently its ability to contribute usefully to school design, is complicated by two important problems. The first is deficiency in research, especially in real life settings. The second is the fact that different theoretical models are competing for attention. The present study is therefore intended to initiate a remediation of both of these difficulties. The theoretical point of view of this thesis is behavioral. The methodology is empirical and scientific, and thus may be applied in other settings. The research has the practical aim of shedding light on the problems of real-life school environments.

The details of the present problem, its questions and hypotheses, will be discussed in Chapter 3.

CHAPTER 3

DETAILS OF THE PROBLEM

From the literature surveyed it seems reasonable to expect that certain environmental factors such as walls and their location, furnishing arrangements, transportation routes, climate, color, and other elements of design, will contribute to the shaping of human behavior in certain directions. It also appears that not enough information currently exists to enable confident predictions of the probable extent of behavior change when one, or especially more than one, of these environmental contingencies are altered. If, for example, the removal of interior walls is expected to result in increased mobility, then modification of seating arrangements, addition of special furnishings, or rigid physical definition of transportation routes could have the effect of enhancing, cancelling, or even reversing this expectation. Similarly, if it were desired to increase work productivity in a school or factory, the hypothesis that distractions must be reduced cannot be accepted without qualification. In many circumstances very low or monotonous stimulation levels cause boredom and fatigue and thus reduce effort and output. Only empirical data can successfully establish the parameters of relationships such as this.

At a descriptive level, case studies of particular settings might be done to determine the relative frequencies and locations of on-task working activity, off-task distracted behavior, social interaction, movement, and so on. Once this information has been collected, it would be feasible to state objectives for change and proceed with theoretically

plausible environmental or administrative innovations.

Descriptive studies of a comparative nature might be conducted to investigate behavioral differences among settings, and when specific and systematic control of these settings is possible, true experimental research could be instigated.

The research described here is of a descriptive and comparative nature. It is not a case study, because two styles of school are observed and certain controls are applied. It is not an experiment, since control of environmental variables by the investigator is not directly possible.

Several specific questions are addressed. In all cases the independent variable is the type of school design--open-area or traditional space--and all dependent variables are pupil behaviors, pupil locations, or pupil social settings.

Three classes of hypotheses are presented. The first group are referred to as "exploratory hypotheses on categories" and are derived directly from the categories employed for observation. All of these exploratory hypotheses are non-directional. They are each of the form, "Within this category (of behavior, location, or social setting) are the frequencies of codings the same for both school types?" A chi-square analysis is performed on each pair of frequencies for each coding to obtain an indication of the significance of any departure from the expected equal partition of entries. The general null-hypothesis for these tests may be stated, "That no differences exist between the two school environments when compared on any level of any dimension of the observational categories designed for this study."

The second class of hypotheses will be called "exploratory

hypotheses on patterns." These are also non-directional, and relate directly to the observed data. However in this case, two-way interaction cells such as behavior by location, social setting by behavior, and so on are compared by inspection of relative frequencies. Of interest are questions of the form, "For any given behavior, in what locations is it represented, and in what locations does it predominate?" Other questions for other interactions are analogous. The general null hypothesis for this class is, "That no differences exist between the two school environments when patterns of two-way interactions among the dimensions of this study are compared." Results for both classes of exploratory hypotheses are presented in Chapter 5. No results for three-way interactions are reported, since they have been judged by the author to be of negligible value.

The third class of hypotheses are "hypotheses from the literature." These arise from the expectations and research results discussed in Chapter 2. Many predictions and reports can be checked against the data of this study, some may be only partially testable, and a number defy analysis altogether in terms of the dimensions investigated here. The procedure for testing an hypothesis from the literature occurs in two stages. First it is necessary to decide which, if any, of the dimensions and categories employed here apply to the expectation as stated, then the results must be consulted in each relevant category to determine whether or not the hypothesis is supported or contradicted. The direction of the hypothesis is the direction indicated by the author or authors who are referred to as sources. When more than one behavior, location, or social setting applies, it is necessary to draw a consensus. Occasionally this consensus is

inconclusive. No formal statistical procedures are applied for these hypotheses, other than the chi-square analyses performed on the basic dimensions. The results of this study as they apply to hypotheses from the literature are presented in Chapter 6.

A fourth class of questions might be termed "hypotheses from the reader." The tables reporting results are located in a group at the end of the thesis in order to facilitate their use as a resource for readers or researchers who may wish to test expectations of their own. Use of the data in this way requires that the investigator be able to translate his question into terms related to the dimensions of this study. If this can be done, the procedure is identical to that employed for testing hypotheses from the literature. Hopefully a number of inquiries about the activity of the normal student in an open-area or a closed setting can be at least partially answered.

Exploratory Hypotheses on Categories

This class of hypothesis, as indicated, relates directly to the categories employed for observation or to selected combinations of categories within a dimension. Descriptions of these classifications and comments on their development are presented in Chapter 4. At this point only a concise listing of final codes employed will be presented. In each case the null-hypothesis is that no difference in frequency of occurrence exists between school types. The figures within parentheses are abbreviations for the categories.

Behavior Categories

The categories used to record activity within the behavior dimension are

1. The pupil reads a reference book or textbook (B01).
2. The pupil reads in a notebook or workbook (B02).
3. The pupil writes (B03).
4. The pupil attends to a presentation by a teacher (B04).
5. The pupil attends to an audio-visual media presentation (B05).
6. The pupil independently uses audio-visual equipment (B06).
7. The pupil alters anonymity or independence within the large class group by raising the hand for attention, or by asking or answering a question (B07).
8. The pupil engages in procedural or housekeeping activity such as assembling or putting away books and materials (B08).
9. The pupil engages in miscellaneous on-task activity not covered by another category (B09).
10. The pupil travels from one place to another (B10).
11. The pupil manipulates the physical environment (B11).
12. The pupil engages in off-task distracted or withdrawn behavior (B12).
13. The pupil engages in on-task active social interaction (B13).
14. The pupil engages in off-task active social interaction (B14).
15. The pupil engages in on-task passive social interaction (B15).
16. The pupil engages in off-task passive social interaction (B16).
17. The pupil looks at an observing researcher (B17).

Location Categories

The categories used to record activity along the location dimension are

1. The student is in his or her own assigned desk, within his or her own assigned class area (L01).

2. The student is at another pupil's desk, within the assigned class area (L02).
3. The student is at the teacher's desk, within the assigned class area (L03).
4. The student is in the aisle or on the floor of the assigned class area (L04).
5. The student is at a table, within the assigned class area (L05).
6. The student is at a blackboard, within the assigned class area (L06).
7. The student is at a wall, window, partition, or display board, within the assigned class area (L07).
8. The student is at a shelf or cupboard, within the assigned class area (L08).
9. The student is at a support area such as a cloakroom or sink, within the assigned class area (L09).
10. The student is in the aisle or on the floor of a class area other than the one assigned (L10).
11. The student is at a table in a class area other than the one assigned (L11).
12. The student is in the aisle or on the floor of an informally created sub-area of the assigned class space (L12).
13. The student is on a chair in an informally created sub-area of the assigned class space (L13).
14. The student is at the librarian's desk in the media-library center (L14).
15. The student is in the aisle or on the floor of the media-library center (L15).

16. The student is at a table in the media-library center (L16).
17. The student is at a shelf in the media-library center (L17).
18. The student is in a hall of the school (L18).
19. The student is in a restroom of the school (L19).
20. The student is in the aisle or on the floor of a specialty classroom such as a music room or laboratory (L20).
21. The student is at a table in a specialty classroom (L21).
22. The student is outdoors (L22).

Social Setting Categories

The categories used to record activity on the dimension of social setting are

1. The child is alone or is part of a large class group (S01).
2. The child is with one peer of the same age and same sex (S02).
3. The child is with one peer of the same age and opposite sex (S03).
4. The child is with two peers of the same age and same sex (S04).
5. The child is with two peers of the same age and opposite sex (S05).
6. The child is with two peers of the same age, one of the same, sex, one of opposite sex (S06).
7. The child is with three or more peers of the same age and same sex (S07).
8. The child is with three or more peers of the same age and opposite sex (S08).
9. The child is with three or more peers of the same age with both sexes included (S09).

10. The child is with a younger peer or peers of either sex (S10).
11. The child is with the teacher of his or her assigned class or a designated substitute or student teacher (S11).
12. The child is with a teacher of another class (S12).
13. The child is with a teacher-aide or a classroom helper (S13).
14. The child is with the librarian (S14).
15. The child is with the teacher plus one same sex peer (S15).
16. The child is with the teacher plus one opposite sex peer (S16).
17. The child is with the teacher plus two same sex peers (S17).
18. The child is with the teacher plus two opposite sex peers (S18).
19. The child is with the teacher plus two peers, one of each sex (S19).
20. The child is with the teacher plus three or more peers of any sex (S20).
21. The child is with the teacher plus a younger peer or peers (S21).
22. The child is with an administrator or an administrator plus the teacher (S22).

Selected combinations of some of these codings on each dimension are also tested and discussed in Chapter 5 as exploratory hypotheses on categories.

Exploratory Hypotheses on Patterns

Six patterns of interaction among the three dimensions are investigated. The six corresponding questions are presented below. In all cases the null hypothesis is that there will be no difference between the school types in terms of these interactions.

1. For each individual behavior category, which locations are

represented? Is there a notable difference between open-area and traditional schools in terms of relative frequencies with which certain locations are noted or in terms of the variety of locations recorded for that behavior?

2. For each location category, which behaviors occur there? Are there differences in number of behaviors represented or in relative frequencies, between the two school types?

3. For any behavior category, what social settings are associated with it? Do the environments differ in terms of variety or relative frequency of social setting for that behavior?

4. For any social setting, what behaviors are noted? Are there any differences in variety or relative frequency?

5. For each location, which social settings are represented? Do the school types differ?

6. For a given social setting, where is it located in each environment? Are there differences?

All of the above questions are of parallel form. Differences to be noted are in the variety of interaction and the relative frequencies associated with an interaction.

Hypotheses From the Literature

These hypotheses are derived from the review of the literature in Chapter 2. The sources of these expectations are noted below. Translation of these statements into the terms of this thesis is done in Chapter 6 where results are also reported. This translation is not always exact either because the frame of reference of the original author does not coincide with the orientation of this study, or because

the categories employed here are not precise enough to make the necessary qualifying distinctions. The discussions in Chapter 6 attempt to clarify just what degree of confirmation or contradiction exists. The direction of all hypotheses is the direction indicated by the source referred to.

1. That increased access to the media-library center occurs in open-area schools (Hersom, 1971; Hersom & MacKay, 1971; Ingalls, 1969).

2. That there is more constant and closer teacher with student interaction in an open-space environment (Allen, 1972; Cheek, 1970; Ellison et al., 1969; Hersom, 1971; Ingalls, 1969).

3. That teachers share classes more often in open-area (Ingalls, 1969; Kaelin, 1970).

4. That more independent work and study occurs in open-area (Johnson, 1970; Kaelin, 1970).

5. That there is more between pupil interaction in open-area schools (Anderson, 1970; Cheek, 1970, Hersom & MacKay, 1971; Ingalls, 1969; Johnson, 1970; Shaw, 1971).

6. That there is less misbehavior and less boredom in open-space schools (Brunetti, 1971; Halton County, 1969; Shaw, 1971).

7. That more movement occurs in open-areas (Ellison et al., 1969; Johnson, 1970; MacPherson, 1972; Shaw, 1971).

8. That there is less physical, social, visual and auditory protection in open-space, and consequently less privacy (Drew, 1970).

9. That there is less spatial variety in open-area schools and less use of peripheral space (Chapman, 1970; Drew, 1970).

10. That less large group instruction occurs in open-areas (Allen, 1972; Johnson, 1970). The contrary is reported by Ellison et al.

(1969).

11. That more pupil questioning will be found in open-area (Burnham, 1970).

12. That learning is more active than passive in the open-space school (Shaw, 1971).

13. That there is more variation of class size in open-area (Hersom, 1971; Hersom & MacKay, 1971; Johnson, 1970).

14. That increased involvement of parents or visitors is possible with less disruption in open-space (Anderson, 1970; Drew, 1970; EFL, 1969).

15. That there is less flexibility and mobility in open-area schools (Drew, 1970).

16. That there is more use of a learning center approach in open-space (Shaw, 1971).

17. That more experimentation with space and furnishings occurs in open-areas (Anderson, 1970; Eberle, 1969; Hersom, 1971; Hersom & MacKay, 1971).

18. That team teaching is more common in open-area (Eberle, 1969; Hersom, 1971; MacPherson, 1972).

19. That there are more activities and variety of learning materials in open-space schools (Brunetti, 1971; Eberle, 1970; EFL, 1969; Hersom, 1971).

20. That less time is devoted to routine in the open-area (Ellison et al., 1969).

21. That there is no difference in the use of printed matter between the two types of school (Sudbury Board of Education, 1972).

Because certain measures did not form part of the design for this

study, some expectations for open-area schools cannot be tested. These include the incidence of use of various instructional approaches such as non-graded programs, discovery learning, contract learning, programmed learning, program individualization, ability grouping, and pupil participation in program planning. Also, pupil attitudes or problems such as difficulty adapting, fear of failure, outlook toward school, or personal responsibility and initiative cannot be commented upon. Subject matter emphasis was not noted. Teacher and administrative variables such as degree of interaction, co-operative activity, team-teaching, scheduling, innovative approaches, or attitudes in general were not measured and thus are not discussed.

In summary, three classes of hypotheses have been established which characterize the present problem (a) exploratory hypotheses on categories, (b) exploratory hypotheses on patterns, and (c) hypotheses from the literature. The particulars of the research design for testing these hypotheses are described in Chapter 4.

CHAPTER 4

DESIGN OF THE STUDY

Background

Reported results of previous research on open-space schools were reviewed in Chapter 2. A variety of methods were employed in those studies.

The most popular procedure has been the distribution of questionnaires to principals, teachers, pupils, and even parents (Allen, 1972; Carson, Johnson, & Oliva, 1973; Cheek, 1970; Hersom & MacKay, 1971; Kaelin, 1970; Ledbetter, 1969; MacPherson, 1972; Meyer & Cohen, 1970; Mister & McCann, 1971; Myers, 1971; Pritchard & Moodie, 1971; Sudbury Board of Education, 1972; Townsend, 1971; Warner, 1970, Ziegler, 1973). Questionnaires have been used alone, or in conjunction with other techniques. Content varies considerably but many items commonly refer to perceptions or attitudes regarding space, pupils, organization, instructional methods, and team teaching.

Interviews have also been frequently utilized, often with questionnaires (Allen, 1972; Cheek, 1970; Hersom & MacKay, 1971; Murray, 1971; Sudbury Board of Education, 1972; Warner, 1970). Open questions have sometimes been employed as well (Justus, 1971; Kyzar, 1972).

Another common method of data gathering has been administration of standardized tests and scales such as the Children's Personality Questionnaire (Carbonari, 1971; Wren, 1972), the Children's Manifest

Anxiety Scale (Wren, 1972), Edward's Personal Preference Schedule (Carbonari, 1971), Osgood's Semantic Differential (Evanechko, 1973), and the Coopersmith Self-Esteem Inventory (Sackett, 1971).

Achievement tests, mental ability tests, and tests of basic skills have also been widely used (Johnson, 1970; Kennedy & Say, 1971; Killough, 1971; MacPherson, 1972; Sackett, 1971; Townsend, 1971; Warner, 1970).

Finally, observation was employed on students (Allen, 1972; Burnham, 1970; Johnson, 1970; Kyzar, 1972; MacPherson, 1972; Metropolitan Toronto School Board, 1971; Sudbury Board of Education, 1972), and teachers (Ellison et al., 1969; Kyzar, 1971; Metropolitan Toronto School Board, 1971; Townsend, 1971). Flanders Interaction Analysis was also used (Dilling & Tran, 1973; Townsend, 1971; Warner, 1970). Observations are often only part of a research procedure which emphasizes other kinds of measures.

Interviews and questionnaires may be overemphasized as data gathering procedures, at least when environmental factors are being investigated. Paper and pencil measures or verbal reports are handy for certain purposes, but they are often inadequate when used alone. The degree of coincidence between what is expressed and what is actually done in practice, is not always high. It is also very difficult to control all or even some of the variables that influence a subjective response. Many causal factors may be ignored. The same characteristics that make phenomenology unacceptable to behaviorists also create skepticism about attitude measures.

Standard tests are more acceptable, but once again the problem arises of establishing congruence between what is measured and the

"real life" variables that are actually of interest. A particular test must be appropriate. When time and effort are at a premium, a standard test can provide a convenient descriptive assessment, but when detailed observation is possible in a natural setting, more information can usually be obtained.

Like standard tests, observation methods vary considerably in their sophistication. In both cases important concerns must be the construction of categories or items, the specificity of the measures, and the degree and type of inference necessary for drawing conclusions. Also, tests or observation procedures may be evaluated according to the degree of emphasis placed upon empirical performance measures rather than assessment of vague "faculties". Important as well, is the matter of how successfully a method is able to discover the functional as well as structural relationships in a situation. This is necessary so that the diagnosis of some state of affairs can be accompanied by an appropriate prescription.

The research design employed here was chosen and developed because of a philosophical and scientific predilection to radical behaviorism, and the conviction that empirical evidence gathered in ordinary settings by the method of observation was necessary for the discovery of how school environments really work. As a prelude to the ultimate development and implementation of a functional paradigm in environmental psychology, basic descriptive research with a behavioral orientation seemed to be called for. No particular theory underlies the present study.

A specific approach to objective analysis of behavior in architectural space was suggested by Winkel and Sasanoff (1966). They

employed a method called "tracking" for observing and recording activities (especially movement) in a real life museum setting. Travel was recorded on a plan of the building by inconspicuous observers who also noted time spent not moving and other subject behaviors. They also attempted to develop a simulation method whereby tracking could be accomplished for a subject seated in front of an arrangement of movie screens.

In a similar vein, Ittelson, Rivlin, and Proshansky (1970) developed a technique called "behavioral mapping" which they used to investigate "the gross, overt, observable behaviors that, taken together, actually make up the daily routine" (p. 660) on psychiatric wards. The collection of data was carried out by live recorders who noted behaviors according to an instantaneous time-sampling schedule over extended periods of time. These records yielded lists of behavior which after editing and combining were reduced to a fewer number of observational categories. Observational categories were then grouped in order to create analytic categories for presentation and comparison. These categories, they point out, must be explicit, precise, and relevant to the problem under consideration. As well, they must be empirical and not postulated entirely on theoretical a priori grounds. For this reason a pilot study is recommended.

Ittelson et al. suggest that the behavioral map be presented as a table. These maps are quantitative as well as qualitative and permit comparisons to be made. The authors reported results in terms of absolute frequencies or percentages of behavior in locations.

Although the emphasis was on observation of individual subjects in the 1970 study, Ittelson et al. suggest that group activity may be

similarly mapped, and they claim to be developing approaches to this problem.

The model of Ittelson and his colleagues has been enthusiastically adopted for the present study, however some improvements on their pioneering design have been attempted (a) the sample of environments is larger and two distinctly different architectural spaces are compared, (b) separate social categories have been created, (c) codes for locations have been made more specific, (d) individual tables of behavior, location, and social setting have been presented, and tables for the interaction of behaviors or locations with social settings have been added. Of course the specific categories employed for this study, and the observation schedules used, only superficially resemble those employed by Ittelson et al. since the school environment differs radically from the psychiatric ward.

Design Details

The independent variable in this research is the architectural design of educational space. Two types of school are included (a) open-area, and (b) traditional classrooms. No controls are exerted on specific environmental details such as color, windows, entrances, floor coverings, furnishings, or furniture arrangement. It is assumed that differences in any of these specifics may be attributed directly or indirectly to differences in the complex variable of architectural design.

The dependent variables in the study are (a) behavior of pupils, (b) location of pupils, and (c) social settings of pupils. Measures of the dependent variables consist of frequencies of occurrence at each

level of each variable. These levels are defined later in this chapter. Patterns of interaction among the three dimensions are also examined, and in this case as well, the basic measure is frequency of occurrence.

The Sample

Three open-area schools and three schools of traditional design were included in this study. These were selected by the Edmonton Public School Board. Although the original request to the Board was to supply one elementary school of each design in each of a high, medium, and low status socio-economic sector of the city, the schools actually provided were two of each design in medium socio-economic sectors, and one of each in high socio-economic sectors of Edmonton. All school personnel involved in the study were approached by the researcher, and all expressed a willingness to participate.

In each school, two classes were selected for observation. Thus 12 classes and 12 teachers were represented in the total sample. The criteria for selection were

1. Each class was to be grade five. This requirements was a study control for age and academic level.

2. The subject scheduled during observation times was to be language arts. This was a broad control on curricular content, and it is likely that results for language will generalize more easily to the entire curriculum than from any other single subject.

3. No special classes for exceptional students were to be included, nor would a class be used if any formal standard procedure was employed for placing pupils in various classes or environments on

the basis of ability, problems with discipline, or other factors. Discussion with principals revealed that this condition was met.

In each class, a table of random numbers was employed to select three males and three females for observation. This resulted in a total sample of 72 children. One extra child of each sex in each class was also randomly chosen to be observed as an alternate if an original subject was not present due to illness or other reasons not related to the study. All students were observed in the order of their random selection. Since no other criteria were required for selection, it was necessary to assume that individual differences between children would be randomly distributed among the total sample.

The Schedule

Each pupil was observed for 15 minutes on each of two occasions, resulting in 30 minutes of observation per subject and 36 hours of observation for the entire study. Periods of observation were chosen subject to these conditions:

1. A language arts class which included the subject was to be in progress. At least three minutes were allowed to elapse between the scheduled beginning of the class and the commencement of observations. If class changes were delayed, or the subject was late coming, observations began one minute after his arrival. When two or three 15-minute observations could be obtained in one class period, the interval between them was limited to the time required to locate the new subject, unless an extended intermission had been planned ahead of time. All observations were scheduled to terminate at least three minutes before the end of the class. If students were dismissed early, recording was

continued only if two minutes or less of observation time remained. If more than two minutes were left, recording was halted and the observation discarded.

2. The two occasions of observation per pupil would be made on different days.

3. A different observer (two were employed) would conduct the observation on each of the two occasions for one pupil. An equal number of first and second codings were done by each recorder.

4. Only one observer at a time would record for any child, except for those instances where data was to be used to establish interrater reliabilities. Never would a coder record for two children simultaneously.

During each 15-minute observation period, data were coded by an observer on an instantaneous time-sampling basis at 10-second intervals. This yielded 90 recordings per pupil per 15-minute session and a total of 12,960 recordings for the entire project. At each instant, behavior of the subject, location of the subject, and social setting of the subject were recorded simultaneously on a prepared observation sheet using established letter or number codes where possible, or by writing if necessary. Lapses in the record were rare, but when they happened, the convention was adopted to assume that no change had occurred and to re-record the immediately preceding notation.

The Instrument

The observation sheet used in the collection of data is shown in Appendix A. Information about the school, type of school, child, teacher, room, date, time, and observer was noted prior to the start of

recording, and later entered as an identification number code.

The sheet provided space for writing mnemonic codes for location and social setting as well as long hand descriptions of behavior where necessary. Cells for recording final number codes were also included. Mnemonic codes were useful, although as the study progressed they were used less often and most entries were placed directly into the spaces for final codes. In the case of location and social recordings, the convention was adopted that these would be entered at the start of an observation and only re-entered if there was a change. Thus any blank space actually contained the same entry as the last full space above it. Each sheet possessed 90 rows in two columns. Darker lines distinguished each of the 15 minutes.

Observation sheets were mounted on a clipboard and a watch with a sweep second hand was attached. All recording was done in pencil. Appendix A shows an example of a completed observation sheet. This instrument proved to be very efficient.

The Categories of Observation

According to Ittelson et al. (1970):

The analysis of behavior into relevant categories and the empirical observation of these behavior categories . . . constitute the two major technical problems of behavioral mapping. . . . Presumably, any category or set of categories of behavior could be used in constructing a behavioral map. Before empirical work can be carried out, however, decisions have to be made as to what kinds of behavior are relevant to the problem being studied. . . . Once the basic

decision as to the kinds of behaviors to be studied is made, the development of the actual behavioral categories is a straightforward process applicable to any setting. It involves three steps: cataloguing observed behaviors, generalizing the behaviors into categories for observation, and combining observational categories into analytic categories. . . . Analytic categories may vary from problem to problem. (pp. 659-660)

Following are descriptions of the categories employed in this study, with explanations of the processes by which they were developed.

Behavior categories. The initial step in the design of the categories for behavior, was to conduct a pilot study (see Appendix B). No predetermined classifications for activity were employed at this stage and long hand notations rather than codes were used. The data obtained in the pilot study formed the basis for the inductive generation of categories (see Appendix B for a detailed account of this process).

In conjunction with this inductive procedure, decisions were made which clarified the conceptual basis of the classifications. These decisions related to the relevance of a potential category for the present purposes, the degree of inference required to label a behavior, and the precision of necessary discriminations or generalizations. A review of category systems employed in other research was undertaken at this time. Those which were found helpful are mentioned below.

Bales (1950) method is primarily designed for research and training in the observation of small-group dynamics in problem solving

situations. It permits live recording of two or more subjects by one observer. The Bales categories involve problems of information, evaluation, control, decision, tension management, and integration.

Bales system was not adopted for several reasons: (a) a class of school children does not qualify as a small group, (b) considerable anonymity rather than interaction was anticipated, (c) the inductively evolving categories of the present research did not correspond closely to those of Bales, and (d) relating his categories to the environmental variables of interest was stretching the applicability of the system beyond its present limits. Nevertheless, Bales' distinction between task oriented and affectively oriented behaviors, was the inspiration for employing broad "task" and "social" classifications in the present study.

"On-task" refers to that class of behaviors which are apparently sanctioned by a pupil's teacher or by the nature of the curriculum, and "off-task" to behaviors that are not so sanctioned. Examples of on-task behavior include reading, writing, asking or answering questions, or attending to a class presentation. Off-task activities might be looking out a window, chewing a pencil, making a paper airplane, or simply fidgeting.

"Social" refers to behavior which occurs with others who are in relatively close personal contact with the subject. "Alone" refers to a situation where no significant interpersonal contact is occurring and the subject is separated from others by virtue of distance or the anonymity which characterizes inclusion in a large group. Examples of social activity are talking to a particular person or listening to someone nearby.

Task and social classifications mutually interact with one another, thus it is possible to refer to a particular behavior as "on-task, social" or "on-task, alone", or as "off-task, social" or "off-task, alone".

Lindvall (1967) developed a system employing five general classifications: (a) independent work, (b) teacher-pupil work, (c) non-instructional use of pupil time, (d) pupil-pupil activity, and (e) group activity.

Specific categories considered and adapted to the present system were (a) reading independently, (b) independently using a tape recorder or film strip, (c) seeking or receiving assistance from the teacher, (d) spending time not working or talking to other pupils, (e) waiting for provision of lesson materials or directions, or going to get materials, (f) asking for or receiving assistance from another pupil, (g) contributing to a group discussion, or asking a question, (h) listening to a teacher lecture or watching a teacher demonstrate, and (i) watching a film or listening to records in a group.

Lindvall's system was not acceptable as a whole because the total number of categories was too large, and many included social referents which could be more adequately expressed by a separate social code. Also, many categories appeared to be too general or specific based on the inductive analysis of pilot study data.

Spaulding (1967) developed the Coping Analysis Schedule for Educational Settings (CASES). He proposes 13 categories: (a) aggressive behavior, (b) negative or inappropriate attention getting behavior, (c) manipulating and directing others, (d) resisting authority, (e) self-directed activity (further qualified as appropriate or inappro-

priate), (f) paying rapt attention (similarly qualified), (g) sharing and helping (also qualified), (h) social interaction (also qualified), (i) seeking support, assistance, and information (also qualified), (j) following directions passively and submissively (also qualified), (k) observing passively, (l) responding to internal stimuli, and (m) physical withdrawal or avoidance.

Spaulding's system was not employed primarily because an unacceptable degree of inference is required in most categories.

Kowatrakul (1959) designed a method for observational research in the classroom. He proposed codes along three dimensions:

1. Pupil behaviors are categorized as: (a) intent on on-going work, (b) social work-oriented, (c) social-friendly, (d) momentary withdrawal, (e) intent on work in an academic area other than that assigned, (f) intent on work in a non-academic area.

2. Classroom activities are recorded as: (a) independent seat work, (b) watching and listening, and (c) discussion.

3. Subject areas are indicated by one of: (a) language, (b) arithmetic, (c) social studies, and (d) science.

This system supported the broad classifications of on-task, off-task, social, and alone that are used in the present study. The category of "momentary withdrawal" was also adopted.

Perkins (1964) slightly expanded Kowatrakul's behavior categories into: (a) interested in ongoing work, or passive listening and watching, (b) reading and writing, or active working in an assigned area, (c) high activity and involvement as in reciting or using large muscles, (d) intent on work in another curricular area, (e) intent on work of a non-academic type such as preparing for an assignment or

cleaning out desks, (f) social work-oriented with a peer, (g) social work-oriented with a teacher, (h) social-friendly, (i) withdrawal or detachment from people, ideas, or the classroom situation.

This model suggested and supported several aspects of the present design. Particularly, the distinction between active and passive task areas was adapted for application to social behaviors. This resulted in four categories of social interaction differentiated according to task orientation (on-task or off-task) and expression (active or passive).

The separation of Kowatrakal's "social work-oriented" classification into two items, one for work with a peer and the other for work with the teacher, encouraged the use of a system of social setting codes which would facilitate this type of distinction.

Finally, Perkins' description of "work of a non-academic type" implied that preparatory and housekeeping sorts of activities might be considered a distinct category.

Matthews (1968) devised the Science Curriculum Assessment Systems (SCAS) which allowed for observation of both teacher and students. The student system employs 10 categories, each of which is qualified as lesson-related or non-lesson-related. These are (a) miscellaneous, (b) observes the teacher or a student who demonstrates for the teacher, (c) follows the teacher's directions or suggestions, (d) does not follow any specific teacher direction, (e) responds to a teacher's question or request, (f) initiates, attempts to initiate, or continues an interaction with the teacher, (g) initiates interaction with another student, (h) receives ideas from another student, (i) copies another student or follows the instructions of another student, and (j) gives

ideas to another student.

The present research follows Matthews in emphasizing the distinctions between on-task and off-task behaviors, and between active and passive communication. However, the various possibilities he suggests for teacher-student interaction are classified somewhat differently.

Other classroom observation systems whose principal focus is the teacher, such as Flanders (1965, 1970), Spaulding (1967), and Matthews (1968) were reviewed. Since it was decided that only pupils would be observed, these systems were of minor importance and are not discussed here.

This is the complete behavioral categorization system employed in this study, as it evolved from successive grouping and regrouping of the pilot data and from consideration of other proposed classifications:

1. Reads a reference book or textbook. This is abbreviated as "B01". Other abbreviations used below are analogous. Classed as an on-task, alone activity, it includes the behaviors of looking at the book as if reading, or turning the pages of the book. Examples are (a) looking at a word in a speller, (b) moving the eyes in a scan over a page of a textbook, and (c) turning the pages of a dictionary.

2. Reads in a notebook or workbook or workbook (B02). This is classed as an on-task, alone activity. It includes looking at the book as if reading or turning the pages of the book. Examples are (a) looking at a word in a spelling notebook, (b) moving the eyes over a paragraph in a workbook, and (c) turning the pages of looseleaf notes.

3. Writes (B03). This is an on-task, alone activity. It includes writing on paper with a pencil or pen. It specifically excludes writing

on a blackboard or wall surface (this would be coded as miscellaneous on-task behavior, B09), drawing or other artwork (this would be coded B09 as well), and doodling or destructive scribbling (this would be coded as off-task distracted or withdrawn behavior, B12). Examples are (a) writing a composition, (b) taking notes, and (c) writing answers for an examination.

4. Attends to a presentation by a teacher (B04). This is an on-task, alone activity. It includes orienting toward a teacher, looking at a teacher, or listening with a posture of attention. It also includes attending to a presentation by a designate of the teacher such as a peer, aide, student teacher, or team teacher. The term "presentation" includes lectures, demonstrations, answers to questions, announcements, directions, or examinations, as well as non-vocal presentations such as writing on the blackboard or using an overhead projection. The person presenting need not be within the field of vision of the subject; this category may be employed if other observable criteria indicate attention is being paid. This classification specifically excludes attending to any audio-visual media presentation other than blackboard or overhead projection. Examples are (a) listening to a peer reply to a question asked by the teacher, (b) watching a laboratory demonstration, and (c) reading something written on an overhead and projected on a screen.

5. Attends to an audio-visual media presentation (B05). This is an on-task, alone activity. It includes orienting toward, looking at, or listening with a posture of attention to a film, film strip, slide presentation, television show, audio disc or tape recording, or other electrically powered audio-visual aids. Specifically excluded are

looking at books (B01), at pictures or maps (B09), at the blackboard or overhead (B04), and at a play or skit (B09). Also specifically excluded is attending when it accompanies independent use of audio-visual equipment by a single pupil (B06). Examples are (a) watches a closed circuit or taped television program, (b) listens to a recorded lecture, and (c) watches a movie in a theater.

6. Independently uses audio-visual equipment (B06). This is an on-task, alone activity. It includes procedures for setting up, putting away, or attending to a piece of audio-visual equipment or the program it plays. It is necessary that the subject be separated from the teacher with no more than two other peers, and appear to have at least an equal share of the responsibility for the care and operation of the equipment. Examples are (a) sets up a record player for individual use, (b) watches a film with two classmates, and (c) records the voice of a friend on tape.

7. Alters anonymity or independence (B07). This is an on-task, alone activity. It includes brief changes in the normally "isolated" status of a single pupil in a class group, whether he instigates such changes or not. Specifically excluded are behaviors codable as social interaction (B13, B14, B15, B16), and attending behaviors (B04, B05). Examples are (a) raising a hand for attention, (b) answering a teacher's question which was directed specifically to the subject or to the class as a whole, (c) offering a comment in a group discussion, and (d) reciting or reading aloud.

8. Engages in procedural or housekeeping activity (B08). This is classed as on-task, alone. It includes behaviors whose primary function appears to be to prepare for other educational tasks or to conclude a

task, such as searching for or assembling books or materials, or putting those things away. Waiting is also included when it appears to be for an on-task purpose, and when other codings are not appropriate. Specifically excluded are listening to directions (B04), opening books or turning pages (B01, B02), and signalling for attention (B07). Examples are (a) looking for a pencil, (b) looking for library books, and (c) waiting for the librarian to check out a book.

9. Engages in miscellaneous on-task activity (B09). This is classed as on-task, alone. It includes behaviors apparently on-task, but not fitting into any other category. Examples are (a) writing on the blackboard, (b) doing artwork, and (c) playing a game with the permission of the teacher.

10. Travels (B10). This is an on-task, alone activity. (All travel is classed as on-task by convention, since it is usually very difficult to establish the actual function of travel at the instant of observation.) Included are the behaviors of walking, running, crawling, climbing, or riding, as well as the acts of entering or leaving a desk or chair, standing up from another posture, and opening or closing doors between rooms or halls. Examples are (a) walking across the room, (b) jumping over a barrier, and (c) getting up from the floor.

11. Manipulates the physical environment (B11). This is an on-task, alone activity. It includes moving large elements of the physical environment such as furniture, or altering aspects of the building structure or climate. Specifically excluded is the opening or closing of doors (B10). Examples are (a) opening or closing a window, (b) adjusting lighting or heating controls, (c) moving a partition, and (d) moving a chair.

12. Engages in off-task distracted or withdrawn behavior (B12).

This is an off-task, alone activity. It includes behaviors which do not appear to be on-task and are not social in character. Specifically excluded are minor changes of posture apparently necessary for comfort or task performance (these are not coded separately), social interaction (B13, B14, B15, B16), and looking at an observer (B17). Examples are (a) closing the eyes, (b) fidgeting, (c) playing with a pencil, (d) looking about the class but not attending and not establishing any communicative relationship, (e) appearing to be "daydreaming," and (f) doodling on paper or desks.

13. Engages in on-task, active, social interaction (B13). Social interaction, in this case and in the following categories, B14, B15, and B16, is defined as verbal or non-verbal behavior of an interpersonal communicative nature, which occurs between two persons or within a relatively close, small group, where the subject is an involved member. Specifically excluded are behaviors described as "altering anonymity" (B07). "Active" refers to situations in which the subject is directing behavior toward the other participants, such as signalling, talking, or touching. In contrast, "passive" describes a situation where the subject receives the communicative behavior of another person, as in watching, listening, or being touched. Examples of on-task, active, social interaction are (a) asking a peer a question related to the lesson, (b) asking the teacher for direction, (c) handing a pencil to a peer, and (d) demonstrating a procedure to a group of three or four peers.

14. Engages in off-task, active, social interaction (B14). Examples are (a) asking a peer what she will do at recess, (b) punching a peer,

and (c) passing an apparently off-task note to another pupil.

15. Engages in on-task, passive, social interaction (B15). Examples are (a) watching a peer correct the subject's examination, (b) receiving individual direction from the teacher, and (c) listening to an explanation by a peer in a small group.

16. Engages in off-task, passive, social interaction (B16). Examples are (a) watches clowning around in a small group, (b) listens to a peer tell a joke, and (c) receives a push from a peer.

17. Looks at an observing researcher (B17). This is an off-task, alone activity. This special category of "distracted" behavior includes looking at, talking to, or interacting in any fashion with an observer who is gathering data for this study.

An 18th category was initially retained in case the 17 classifications failed to represent a truly comprehensive system. In practice, category 18 was never required and never used. It is apparently unnecessary and has been removed from this study.

Certain decision principles were followed in using the behavior classification system:

1. As a general rule, the observer should attempt to record only the most salient behavior exhibited at any instant. In other words, the behavior which is most apparent, or which probably accounts for most of the energy being expended by the subject, should be noted. For example, if travel and conversation are occurring simultaneously, travel would be recorded, if more effort seemed to be expended for this purpose than for talking.

2. An important initial decision is whether the behavior observed is social or alone. Some degree of recorder judgment is required. In

general, for an activity to be considered social, at least one other person must be in a position with respect to the subject which allows that person to function as a stimulus or reinforcing agent for communicative behavior by the subject. The subject must also be in a small group, or in a small group within a larger group, and must apparently be attending to another person. Special qualifications are described in the category definitions. When doubt persists as to whether or not interaction is actually occurring, the coding should be in an "alone" category.

3. Another necessary distinction is between on-task or off-task classification. Some familiarity is required with what is normally appropriate or sanctioned behavior in a classroom. Even though teacher behavior is not formally noted, it is nevertheless often possible to estimate the degree of relationship between pupil activity and teacher expectation. What is occurring in the subject's surroundings can also provide frequent clues about the nature of the task. Likewise, the kind of materials being employed may suggest whether the behavior is on-task. Generally, on-task activity is that which would probably be approved as educationally relevant by the teacher if he or she was consulted. In any event, the decision must rest on observable criteria. If a pupil appears to be "thinking", for example, unless some evidence of an objective nature exists (such as reciting quietly) the activity must be coded as distracted or withdrawn (B12) by default. When doubt persists, behavior should be coded in some "on-task" category.

4. The distinction between active and passive behaviors need formally be made only for social categories. When the subject is "sending" some kind of communication in an interaction, this is coded as

active. If the subject is "receiving" communication, this would be coded as passive. When uncertainty prevails, the observation should be recorded as "active".

5. In the event that two or more equally salient behaviors occur simultaneously, or if a behavior is so ambiguous that no decision can be made on the basis of the four principles just stated, the choice of category should be finally arbitrated by consulting the following hierarchy of priorities: (a) B17 (looks at an observer) is of highest precedence and should be coded whenever it occurs, regardless of what other activities may accompany it, (b) B11 (manipulates the environment) is next in priority, then B10 (travels), (c) the social categories follow in the sequence, B13, B15, B14, B16, (d) the rest of the on-task, alone codes should be used in the order B07 (alters anonymity), B03 (writes), B08 (procedural), B01 (reads textbook), B02 (reads notes), B06 (uses audio-visual equipment independently), B05 (attends to an audio-visual presentation), B04 (attends to a teacher presentation), and B09 (miscellaneous on-task), (e) of lowest priority is B12 (off-task, distracted or withdrawn).

Social setting categories. The development of categories for social settings involved a more direct process of initial selection, since essentially all possible variations of interest could be specified at the outset of the pilot study. The major technical problem did not involve definitions or rules of priority, but rather the creation of a system of codes to permit quick and accurate recording by the observers. These codes were mnemonic and different from the final number codes into which they were translated for counting and analysis. Since only

behaviors B13, B14, B15, and B16 are defined as "social", social setting codes apply just to these. All other behaviors, by definition, are necessarily coded as "alone".

The mnemonic codes consisted of letters and numerals which indicated the nature and size of the group respectively. The symbol "P" was used to represent a peer of the same sex and approximately the same age. "P'" indicated an opposite sex, same age peer. "T" stood for the pupil's assigned teacher, "T'" for a different teacher, and "H" for a teacher aide, helper, or student teacher. Older or younger peers of either sex were represented by "O" and "Y" respectively. A librarian was coded as "L", an administrator by "A", a secretary or clerk by "S", and a member of the custodial staff by "C". Numerals were appended to letters when more than a single other person was with the subject. For example, if a child was in the company of two peers of the same sex, this would be noted as "P2". If a pupil were with two younger peers and their teacher, this would be recorded as "Y2T'" or "T'Y2". When the subject was alone (as defined) the coding was "00" (zero-zero) or a simple check mark.

This method allowed for rapid on-the-spot recording of data. Subsequent translation was accomplished in two steps: (a) immediately after an observation, number codes were assigned to mnemonic codes according to a prescribed system and each of these codes was associated with a defined social setting throughout the computer analysis, (b) once print-outs of frequencies had been obtained, empty cells were omitted, some collapsing of categories was done, and new numbers were assigned for tabulation and presentation purposes.

The final listing reflects the fact that a decision was made to

combine some groups of more than three persons, plus the subject, with groups where three was the actual number. This was done because groups of four (plus subject) were rarely observed in which the criteria that distinguish "social" from "alone" were not violated. It should also be noted that some complex or unusual groups such as a teacher and a custodian with the subject, or a peer and a teacher and an administrator with the subject, could have been coded. They do not appear only because they were never observed.

These are the social setting categories employed in this study:

1. Alone or part of a large class group (S01). The subject is not involved in any social interaction. This code must be applied with all behaviors except B13, B14, B15, and B16. Only subsequent codes (S02 through S22) may be applied to B13, B14, B15, and B16.
2. With one peer of the same age and same sex (S02).
3. With one peer of the same age and opposite sex (S03).
4. With two peers of the same age and same sex (S04).
5. With two peers of the same age and opposite sex (S05).
6. With two peers of the same age; one of the same sex, one of opposite sex (S06).
7. With three or more peers of the same age and same sex (S07).
8. With three or more peers of the same age and opposite sex (S08).
9. With three or more peers of the same age with both sexes included (S09).
10. With a younger peer or peers of either sex (S10). No category for being with an older child is presented since this never occurred.
11. With the pupil's assigned teacher (S11). The "assigned" teacher is considered to be the teacher who has primary responsibility

for the pupil during the period of observation. This may be a designated substitute or team-teaching member. If two teachers share equal responsibility simultaneously, both are coded in this category.

12. With a teacher other than the one assigned (S12). This "other" may be any teacher who does not have primary responsibility for the student.

13. With a teacher aide, helper, or student teacher (S13).

14. With a librarian (S14). This person may be a teacher who is acting as a librarian, but may not be the subject's assigned teacher.

15. With one same sex peer and the assigned teacher (S15).

16. With one opposite sex peer and the assigned teacher (S16).

17. With two same sex peers and the assigned teacher (S17).

18. With two opposite sex peers and the assigned teacher (S18).

19. With one same sex and one opposite sex peer plus the assigned teacher (S19).

20. With three or more peers plus the assigned teacher (S20).

Peers may be of either sex or both sexes may be represented.

21. With any number of younger peers and any teacher. (S21).

22. With an administrator (S22). This may be a principal, vice-principal, or superintendent, and may include a teacher.

Interactions with secretarial or custodial staff are not represented since they did not occur during any observation.

Location categories. As was the case for social setting, it was possible to develop a system of coding for location even before the initial pilot study. This did, however, presuppose a general familiarity with the design and furnishing of classrooms and schools. Mnemonic letter codes were again employed, and subsequent translation

to numbers was required for analysis.

The mnemonic coding system used two-letter combinations to signify a location. The first letter indicated a major area of the building, and the second represented a specific type of place within the larger area. The major areas noted were (a) the assigned class space, coded as "C", (b) another classroom or class space, coded "C'", (c) an informally constructed area within a class space such as that defined by a circular arrangement of chairs or a set of tables, coded "C'", (d) a library or media-library center, coded "L", (e) a hall, coded "H", (f) a restroom, coded "R", (g) a storage room, coded "S", (h) an office, preparation area, or staffroom, coded "O", (i) a specialty area such as a music room, laboratory, art room, or gymnasium, coded "X", and (j) the schoolyard or a courtyard outside the building confines, coded "Y".

The specific places symbolized by a second letter were (a) the subject's desk or assigned place, coded "D", (b) the desk of another pupil, coded "D'", (c) the desk of any teacher or librarian or other personnel, coded "D'", (d) an aisle or floor, or the ground outside, coded "I", (e) a table or carrell, coded "T", (f) a chair without a table, coded "Ch", (g) a blackboard, coded "B", (h) a wall or window, or a portable divider (which may also serve as a display area), coded "W", (i) a shelf, closet, or cupboard, coded "Sh", and (j) a support item such as a cloakroom, sink, or fountain, coded "Z".

Combining first and second letters, there are 100 possible descriptions for space within a school. Not all of these are practically admissible, as it would be highly unusual, if not impossible, for a blackboard to be in the school yard, for example, or a pupil's desk to be in a restroom.

Translation into number codes was again established in two steps: (a) the 100 possible letter codes were identified and counted by computer, and (b) all empty categories were discarded, and the remaining 22 locations were assigned new numbers for analysis, tabulation, and presentation.

The final system employed in the study includes these categories for location:

1. Within the assigned class area, at the subject's assigned desk (L01).
2. Within the assigned class area, at the desk of another pupil (L02).
3. Within the assigned class area, at the teacher's desk (L03).
4. Within the assigned class area, in the aisle or on the floor (L04).
5. Within the assigned class area, at a table (L05).
6. Within the assigned class area, at a blackboard (L06).
7. Within the assigned class area, at a wall, window, or divider (L07).
8. Within the assigned class area, at a shelf, closet, or cupboard (L08).
9. Within the assigned class area, at a support item such as a cloakroom, sink, or fountain (L09).
10. Within another classroom or class area, in the aisle or on the floor (L10). Such a classroom is not to be a specialty room such as an art room, music room, laboratory, or gymnasium.
11. Within another classroom or class area, at a table (L11).
12. In an informally constructed area within a class space, in the

aisle or on the floor (L12).

13. In an informally constructed area within a class space, on a chair (L13).

14. In the library or media-library center, at the librarian's desk (L14).

15. In the library or media-library center, in the aisle or on the floor (L15).

16. In the library or media-library center, at a table (L16).

17. In the library or media-library center, at a shelf (L17).

18. In a hall (L18).

19. In a restroom (L19).

20. In a specialty area, such as a music room, art room, laboratory, gymnasium, or theater, in the aisle or on the floor (L20).

21. In a specialty area, at a table (L21).

22. Outside the school, in a yard or courtyard (L22).

Locations at a storage room or office area are not represented, since they were never observed.

The Procedure

The Edmonton Public School Board was asked for their co-operation in this study, and a request was made for a list of schools which might be included. Suggested schools were visited, and direct requests were made to the administration and staff. At this time informal interviews were also conducted in order to establish if all requirements for the study were met.

Data were collected by two observers over a four week period. Times for observation were chosen at the convenience of the observers and the schools involved, subject to the requirement that a language



arts class was being held as scheduled. By design, no observations were made on Monday mornings or Friday afternoons. The observers would arrive at a school in advance of a pre-arranged starting time, and locate themselves in an inconspicuous part of the classroom. Initially they were introduced to the pupils as "two people from the University of Alberta who are studying schools."

Teachers who were curious about the study were informed as well as time would permit. Children who asked what we were doing were given limited answers. They would be told that we were interested in finding out how people learn in different sorts of classrooms, but not that students were being watched and their behavior recorded.

Each school was visited on at least three occasions before the complete data were collected. At this time, pupils were debriefed.

At the conclusion of a half-day's observations, the recorders discussed the results and resolved any difficulties which may have arisen.

The Analysis of Data

When all observations were completed, the translation of mnemonic codes to numbers was made and checked, then the data were key punched onto computer cards.

The first step of the analysis was to obtain for each school type, open-area or traditional, a frequency count for every category of the study. Frequencies were originally presented in a series of matrices, each of which contained counts in all possible cells of all possible two-way interactions (such as behavior by location, behavior by social setting, and so on). The row and column totals of these matrices were simple frequencies for single categories within behavior, location, or

social setting.

The second step of the analysis was to compute percentages which reflected the proportion of the total behavior which fell in each category, for each type of school. Similar percentages were calculated for the location and social dimensions as well.

Step three was to compare the frequencies in each category for the two kinds of school. Although presentation of percentages permits differences to be noted and discussed, it was decided that subject to certain qualifications and cautions, a series of chi-square comparisons would allow more exact estimations of the significance of such differences.

Chi-square was calculated for every pair of frequencies where one member of the pair was the count in open-area schools, and the other the count in regular-classes. In each case, the expected frequency used in the calculation was equal to the average of the pair. This corresponded to the general null hypothesis that no difference exists between school types. Each comparison had only one degree of freedom.

Two potential problems with this analysis must be noted. One is that use of chi-square requires the assumption that any individual observation be independent of all others. In other words, the probability that any datum will fall in a particular category should not be restricted by whatever recorded event preceded it. In the present study this assumption is not ideally met. Even though 10 seconds elapse between codings, it is still likely that the same behavior has a better chance of being re-observed than if a considerably larger interval had passed. Nevertheless, this violation may not be of great import since there does not appear to be any systematic tendency for any particular

category to be more affected by continuity than any other. Also, because a large number of categories are employed, and even interruptions of a "trivial" nature (such as being momentarily distracted) are recorded, it is possible that continuity effects are somewhat reduced. Changing to a new subject entirely, every fifteen minutes, tends to reduce dependency as well.

The other problem is that by repeating chi-square comparisons a large number of times, the probability is increased of obtaining at least one significant difference. It should therefore be cautioned that if only a few marginally significant differences are found, these may reflect no more than random variation. In the present study, however, as will be reported, the number of significant differences is high (46 out of 61 possible comparisons) and the levels of significance are often extreme (less than $p = .001$).

Step four of the analysis was to review the original frequency matrices for two-way interactions and note which combinations occurred in each school type and with what relative frequencies. This procedure was an "eyeball" survey of patterns, and no statistical calculations were performed. Patterns of three-way interactions were not analyzed, because they would only apply to the four "social" categories of behavior, B13, B14, B15, and B16, and frequencies in the three-way cells would be too low to be considered reliable. Also, it appeared to be very unlikely that any interesting results would appear which were not basically redundant with information already acquired in the two-way analysis.

Step five was to relate the results to the exploratory hypotheses (see Chapter 5) and, in the case of the hypotheses from the literature, to identify which were confirmed or contradicted (Chapter 6).

An interrater reliability was also calculated using Scott's coefficient, π (Scott, 1955), on data gathered during the course of the study. For behavior coding, this coefficient ranged from .74 to .95, and was .83 overall. For location, π ranged from .93 to 1.00, and was .99 overall. For social setting, π ranged from .79 to 1.00, and was .94 overall. Multiplying π -values for behavior, location, and social setting, the combined reliability was .77.

Assumptions and Limitations of the Study

Since only schools are included in this research, it cannot be assumed that variations in other settings would be of the same magnitude or character. Nevertheless, it is suggested that the method employed could be generalized to the investigation of many sorts of architectural space.

Because the present study is descriptive and comparative, no experimental controls are employed. Consequently, specific causal relationships between particular environmental variables and human behavior cannot be established.

No attempt is made to control for the effects of administrative organization or teacher style. These complex factors may account for or contribute to some of the differences observed. Since a reasonably large number of schools and teachers participated, however, randomization of these variations probably occurred to some degree. Generalization of the present results to other school systems will be tenuous if pedagogical, administrative, economic, social, or cultural variables differ markedly.

Since only grade five children are observed, it may not be assumed

that space design would influence persons much older or younger in the same manner or to the same degree. Similarly, only language arts classes are represented, and generalization to other subject areas or activities must be qualified. It is assumed that individual differences in pupil personality and ability are randomly distributed.

It is assumed that the sample of six schools was representative and random although their selection for this study was made by the Edmonton Public School Board rather than the researchers. In two cases, the open-area schools contained regular classrooms in another part of the building, although these rooms were not in regular use by the pupils observed. In what direction this may directly or indirectly influence student behavior is not known.

The fact that open-area spaces are often altered by the placement of partitions and other furniture, is considered to be a result of the design itself, and its unique requirements. These requirements may also contribute to teacher selection or style.

It is assumed as well, that observer presence did not significantly alter the natural behavior of subjects, in either type of school, however a behavior category is included to allow this assumption to be evaluated.

In summary, the design of this study is empirical, behavioral, descriptive, and comparative. A special schedule and instrument are employed to record observations of behavior, location, and social setting of pupils in open-area or traditional schools. Exploratory hypotheses and hypotheses from the literature are tested using a chi-square analysis and less formal techniques. The results of the study follow in Chapters 5 and 6.

CHAPTER 5

RESULTS RELATED TO EXPLORATORY HYPOTHESES

In this chapter will be presented the results of this research as they relate to the exploratory hypotheses on categories and the exploratory hypotheses on patterns which were described and stated in Chapter 3. All tables are located in a group following Chapter 7.

Results for Categories

This section deals with the outcome of the study in terms of the simple comparisons made for each category of each dimension. Tables 1 through 7 apply here. Each of these includes: (a) category codes and summary descriptions, (b) frequencies of occurrence in each school type for each category, (c) percentage of the total observations represented by each frequency, (d) chi-square for the comparison between school types, and (e) an indication of the level of significance for the comparison.

The Behavior Dimension

Table 1 presents a summary of the results for the 17 categories in which behavior was recorded.

The most prevalent activity in both school settings is reading in a reference book or text (B01), but this accounts for a greater proportion of total behavior in the regular-class environment. Pupils in traditional-spaces also spend more time than their open-area counterparts reading notes (B02), writing (B03), and being distracted

off-task (B12). Taken together, these four activities account for 65% of regular-class behavior compared to 51% in open-areas.

Pupils in open-space schools were occupied more often attending to presentations by the teacher (B04), watching or listening to audio-visual presentations (B05), performing procedural, housekeeping tasks (B08), travelling (B10), and engaging in social interaction of all types (B13, B14, B15, B16). Inclusively, these eight behaviors make up 43% of all student activity versus only 28% in regular-classes. The fact that more time in open-areas is spent attending to the teacher does not necessarily imply that the teachers in this setting are more likely to lecture or demonstrate. The higher incidence of distracted behavior in closed-space suggests that when teachers talk there, they are perhaps less likely to be listened to.

Audio-visual equipment is not used independently by pupils in either school environment to any notable degree (B06). Manipulation of the physical environment (B11) occurred only in the open-area, but with a low frequency. Miscellaneous on-task activity (B09) was noted somewhat more often in the regular-classes, but when these three behaviors are combined, the difference all but disappears.

Altering anonymity (B07) occurs about as often in each setting.

The disturbance created by the researchers, as indicated by the frequency of B17, was not negligible, but no difference was found between the two settings in this regard. The figures indicate that on the average a subject would look at an observer once in every 10 or 11 minutes.

Table 2 shows the results of combining some behavior categories in a variety of ways. It can be seen that reading and writing of all

kinds (B01, B02, B03) predominate in traditional environments to a greater extent than in open-space. About 52% of all behavior is of these sorts, in contrast to 41% in open-areas.

Combining B17 (looks at an observer) with other distracted behavior (B12), 15% of the activity in regular-classes is accounted for, compared to 11% in open-areas. However, the total amount of off-task behavior, found by including B14 and B16 (active and passive off-task social interaction), does not differ significantly between the two school types. The implication seems to be that while the total time spent off-task is the same, a greater proportion is social in nature in an open-space setting. This is not surprising when it is noted that all forms of social activity (B13, B14, B15, B16) occur more frequently in this type of school. Perhaps open-areas can facilitate interaction without necessarily diverting energy from work. A good deal of social activity is still on-task (B13 and B15).

When travel (B10) and other procedural types of behavior (B08) are amalgamated, 10% of the open-area observations are included versus 6% in regular-space. As a review of the interactions will indicate, much of this difference is explained by the extra time open-space pupils spend in the library, walking about (B10) and looking for books (B08).

Somewhat unexpected is the fact that more attention is given to teacher and audio-visual presentations (B04, B05) by students in open-areas. Many comments on the acoustic or visual failings of open-space lead to the anticipation that such activities would be somehow hindered. It is also interesting to note that together with on-task social interaction (B13, B15), attending to presentations may compensate for less reading and writing.

The Location Dimension

Table 3 is a summary of how locations were represented in the two kinds of school. Even though the preferred setting in both was a subject's assigned desk in his assigned class area (L01), this tendency was much more marked in regular-classes, where 90% of the observations occurred at this spot, compared to 77% in open-areas.

Considering that more than twice as many codings other than L01 were recorded in open-space (23% versus 10%), and that 20 different locations were noted in contrast to only 14 in closed settings, it appears that mobility and the variety of space employed are both greater in open-areas.

Table 4 compares locations in the two environments by grouping observations according to major building areas only. The assigned classroom as a whole (L01 through L09) was the setting for almost 98% of all behavior in traditional schools. This proportion was 90% in open-space. The majority of behavior outside the class area occurred in the library or media-library setting (L14, L15, L16, L17) in both cases.

The only outdoor activity (L22) was noted in regular-space schools, however the entire sample of this location was the result of a single 15-minute coding session. This cannot be considered a truly representative finding.

Besides the media-library center, other classrooms (L10, L11), specialty rooms (L20, L21), and informally constructed areas within the assigned class space (L12, L13) were occasionally occupied by open-area pupils. In traditional schools, these settings were never observed.

Table 5 presents locations on the basis of specific places within

major areas. After regularly assigned desks, the most occupied spaces in either setting were the aisles and floors, (L04, L10, L12, L15, L18, L20), accounting for 14% of the observations in open-space, and 5% in regular classrooms. Much of this difference is due to greater use of the media-library center in open-areas or can be related to the higher incidence of travel; nevertheless, as the interaction analysis will demonstrate, a considerable amount of on-task, non-travel behavior also occurred frequently on the carpeted floors of open-space. It appears that rugs do create a significant new possibility for space usage in school.

The desk of another pupil (L02) was a much more common location in open-areas. This finding is probably related to the higher incidence of social interaction between peers. A teacher or librarian's desk (L03, L14) however, was visited more often by students in traditional schools. This was associated with the greater amount of on-task social interaction with a teacher that was observed in this environment.

Pupils were found more often at tables (L05, L11, L16, L21) and shelves (L08, L17) in open space. This may reflect a tendency for tables to be in more general use in these settings, but much of the difference can be explained by extensive occupation of media-library centers, where tables and shelves are common furnishings.

Chairs without tables (L13) were apparently employed only in open-areas to create informally defined sub-spaces. This may suggest somewhat more flexibility. Blackboards (L06) and support items such as sinks or fountains (L09, L19) were rarely used.

The Social Setting Dimension

Table 6 summarizes results for the social setting categories employed

in the study. It is clear from this data that most of the time in both types of school is spent alone (S01). Social interaction accounts for 18% of behavior in open-areas, and 11% in regular classes. The greatest proportion of recorded interaction was with a single peer of the same sex in both environments.

Social contact with younger children (S10) was observed only in the open-space, as was contact with a librarian (S14). In both cases, the conclusion that such contact is at least more common than in regular-classes is probably justified.

Contacts with the teacher in small groups (S15 through S21) were infrequent in both kinds of school, however, one-to-one pupil-teacher interactions (S11) occurred more often in traditional space. Communication with an administrator was very rare in either environment.

Table 7 includes information about various combinations of social settings. It is evident that the total amount of peer interaction (S02 through S10) is almost twice as great in open-areas. This partially reflects the larger proportion of social behavior observed.

The preferred form of peer contact seems to be with a single other child (S02, S03) in both school types. However, groups of more than two (S04 through S09) were more common in the open-space than in regular classrooms. Being able to get together with more than one or two other children probably requires leaving the assigned desk. The mobility of open-area pupils that was noted in the previous section, probably helps to fulfil this condition.

Although there is a trend in both school types for children to spend relatively more time with same sex peers (S02, S04, S07) than with opposite sex peers (S03, S05, S08), there is also a marked tendency

for a larger proportion of peer interaction to be with the opposite sex in traditional classrooms. The ratio of same sex to opposite sex contacts in regular-space is less than 2:1; for open-area this ratio is more than 8:1. In the open-area, however, mixed groups (males and females) were much more common than in regular-space. As a consequence, total contact with the opposite sex was actually somewhat greater in open-space.

Adults (S11, S12, S13, S14, S22) appear to interact closely with pupils more often in traditional schools (2.3% of all behavior versus 1.1%). When groups of peers which include the teacher (S15 through S21) are combined with the other "adult" groups, the difference is even more marked (2.6% compared to 1.1%).

The many differences noted in the dimensions of behavior, location, and social setting, appear to be significant and consistent with one another. The general null hypothesis on categories, that there would be no difference, is contradicted.

Results for Interaction Patterns

This section deals with the outcome of the study in terms of the patterns of interaction among the three major dimensions of observation. Tables 8 through 13 apply here. Each of these includes (a) category codes for two dimensions, without descriptions, and (b) frequencies in each cell of the interaction.

Since the purpose of this section is not to compare particular cells but to demonstrate relationships, neither percentages nor a chi-square analysis are presented.

When the total frequency for both school types together is three

instances or less, no entry is made. Such omissions are necessary in order to keep the tables to a convenient size. It is not likely that any significant interaction is overlooked by this procedure, and any missing frequencies may be replaced by "0" (zero) without much loss of information.

Behavior by Location

Table 8 identifies, for each particular behavior, the locations in which it was observed, and the frequency of occurrence in each location.

Reading in a reference book or text (B01) was almost exclusively done at the assigned class desk (L01) in traditional schools. This was also the preferred location in open-areas, but a significant amount of reference reading also occurred in specialty rooms (L20, L21), in the media-library center (L15, L16), and in the aisle or on the floor of the class area (L04). Reading notebooks (B02), however, was almost entirely confined to class desks (L01) in both environments.

Writing (B03) was observed only at the pupils' own desks (L01) in open-space, and only rarely in other locations in regular classes.

Attending to a teacher presentation (B04) was almost always from a class desk (L01) in closed-space schools, but a variety of other settings were occupied for this task in open-areas, especially class aisles and floors (L04). Attending to an audio-visual presentation (B05) was only observed in open-space, where it occurred about equally from class desks (L01), class aisles or floors (L04), and the floor of informally constructed areas within classes (L12).

Procedural routines (B08) occurred in many locations in open-areas including the media-library center (L14, L15, L16, L17). Perhaps

significantly, preparatory and housekeeping activity was greater in open-space even at class desks (L01).

Travel (B10) within the main class area (L01, L04) was recorded with essentially the same frequency for both types of school. The greater overall incidence of travel in open-area must be accounted for by noting the observations in the media-library center (L15).

Except for predominating at class desks (L01) the distribution of distracted and withdrawn behavior (B12) does not suggest any noteworthy difference between environments.

Generally, social behavior of all kinds (B13, B14, B15, B16) was found mainly at a pupil's own desk (L01). In open-space, the next most popular locations were the aisle or floor (L04), or other pupils' desks. On-task social contact (B13, B15) was widely dispersed in open-areas, but not often at the teacher's desk (L03). This, however, was the main site for on-task social activity of regular-class pupils.

It appears that for many behaviors there are contrasts between the two types of school in terms of where the activities occur. The null hypothesis of no difference in this respect should probably be rejected.

Location by Behavior

Table 9 shows that the most common behavior at a pupil's assigned desk (L01) was reading (B01, B02) followed by writing (B03) in both types of school. Behaviors at L01 do not demonstrate any patterns that do not parallel the overall distribution of activity.

Another pupil's desk (L02) was the location for a greater variety of behavior in open-areas. The teacher's desk (L03) was predominately the site of on-task social activity in both environments.

Although the aisles and floors of class-spaces (L04) are more used in open-space, travel (B10) is not the behavior which accounts for this difference. Rather, it is attending to presentations (B04, B05) and social interaction (B13, B14, B15, B16) which increase occupancy of this location.

At walls and windows (L07), primarily miscellaneous on-task activity (B09) was observed. No distracted behavior (B12) was noted here.

Shelves and cupboards of a class space (L08) were only associated with procedural (B08) and reading (B01) activity, and only in regular classrooms.

Use of class areas other than the one assigned (L10, L11), of informally constructed areas within the assigned class space (L12, L13), and of specialty rooms (L20, L21) was only observed in open-area schools. The activities found in these areas notably included reading (B01, B02), attending (B04, B05), and some on-task social behavior (B13, B15).

In the media-library center (L14, L15, L16, L17), which was more often in use in the open-space schools, the major activities were travel (B10) and procedural tasks (B08). Also relatively common was on-task social interaction (B13, B15).

Halls (L18) were rarely used, and only used for travel.

An outdoor setting (L22) occurred only in one traditional school, and was associated entirely with on-task behavior, mostly miscellaneous (B09).

There are apparent contrasts between the two types of environment in terms of what activities occur at particular locations. The null hypothesis of no difference in this respect should probably be rejected.

Behavior by Social Setting

Table 10 includes only behaviors B13, B14, B15, and B16 since it is only in these cases that social codes other than S01, alone, apply.

On-task active interaction (B13) occurred predominantly with younger peers (S10), a single same-sex peer (S02), and mixed groups of three or more (S09) in the open-area. In closed-space, this behavior tended to be with a single same-sex peer (S02) or the teacher (S11).

On-task passive interaction (B15) in the open-area was primarily with mixed groups of three or more (S09), same-sex groups of three or more (S07), younger peers (S10), a single peer of the same sex (S02), and the teacher (S11). In traditional classes, the majority of such activity was with the teacher (S11), and most of the balance of B15 was with a single same-sex peer (S02).

Off-task active communication (B14) was found to be mainly with a single peer of the same sex (S02) in both environments. Second and third most noted in both school types were interactions with a single opposite-sex peer (S03), and with two peers of the same sex (S04).

Off-task passive social behavior (B16) was also associated most often with a single same-sex peer (S02) in each type of school. The second most common social setting for B16 was with a single peer of the opposite sex (S03) in regular-space, but with two same-sex peers (S04) in the open-area.

Overall, on-task social activity (B13, B15) in the open-area occurred usually with groups of three or more peers of the same sex or of mixed sexes (S07, S09), with younger children (S10), or with single same-sex peers (S02). In regular-class settings, most on-task interaction was with the teacher (S11).

Off-task social behavior in general (B14, B16) had similar social settings in both environments.

It seems that only for social interaction of an on-task nature, are there dissimilarities in the two school settings with regard to the type or number of people likely to be involved. The null hypothesis of no difference in this respect should probably be rejected only in the case of on-task social behavior.

Social Setting by Behavior

Table 11 again reflects the restriction that social codes S02 through S22 are only to be applied to the social behaviors, B13, B14, B15, and B16.

For interaction with a single peer of the same sex (S02), behavior was predominantly off-task (B14, B16) in both school settings. The same tendency was evident in one-to-one communication with a single opposite-sex peer (S03), and in contacts with two same-sex peers (S04).

Interaction with two children of the opposite sex was rare in both environments (S05). Groups of one male and one female plus the subject (S06) were noted often only in open-space, and were exclusively on-task (B13, B15).

In larger groups (S07, S08, S09), there was a trend for behavior to be on-task (B13, B15) and passive (B15) in either type of school.

Considering all peer contacts together (S02 through S09), it appears that off-task behaviors predominate in both school settings. Active and passive codings are about equally represented.

Interaction with younger children (S10) was only noted in open-areas, and was almost always on-task.

Contact with a teacher (S10) or librarian (S11) was overwhelmingly on-task (B13, B15) in both settings, and tended to be passive (B15). This tendency persisted in those instances where pupils and teacher formed a small group (S15 through S21).

In the cases where a given social setting actually occurred in both environments, no notable differences in the character of the interaction seem to exist that would distinguish the types of school. Consequently the null hypothesis of no difference in this respect should be retained. The fact that some social settings were never observed in regular space led to the rejection of a different hypothesis (on the categories) that was discussed earlier.

Social Setting by Location

Inspection of Table 12 reveals that the majority of "alone" codings (S01), and interactions with a single peer (S02, S03) occurred at class desks (L01) in both settings. Meetings with a peer of the same sex (S02) also took place in a class aisle (L04) in either environment. In open-areas, S02 was also noted in the media-library center.

Groups of two peers plus the subject (S04, S05, S06) were also often found at class desks (L01) or aisles (L04), and larger gatherings (S07, S08, S09) were understandably less common at desks and more common in aisles or on the floor (L04). These patterns prevailed in both environments.

Interaction with a younger child (S10) happened mostly at L02 (the desk of another pupil--presumably the younger child's), in the media-library center (L14, L15, L16, L17), and in other classrooms (L10, L11).

In traditional classrooms, adult-student contact (S11 through S21) was observed principally at the teacher's desk (L03), almost as often at the pupil's own desk (L01) and occasionally in the class aisle (L04). In open-areas, contact was less frequent and more evenly distributed among the three locations just named.

Because social behaviors were more common and various in open-area; and because a greater number of locations appear to be available as well, it is not surprising that more combinations of these factors are represented, and represented more often, in open-space. Patterns of interaction show evidence of difference. The null hypothesis in this case should probably be rejected.

Location by Social Setting

Table 13 shows that the predominant social setting at nearly every location was S01, alone. As a result, it is usually the truly social categories, S02 through S22, that are of interest.

At a child's own desk (L01) in either environment, the most popular interactions were with a single peer (S02, S03). In traditional classrooms, the only other notable contact at L01 was with the teacher (S11). In open-areas, on the other hand, this was frequently the site for meetings of two peers with the subject (S04, S05, S06).

At the desk of another pupil (L02), interaction in the regular schools was usually S01 (with a single same-sex peer--probably the desk's occupant). However, in open-space the most common social setting at L02 was with a group of three or more peers of the same sex (S07). Also found at this location in open-space were frequent contacts with younger peers (S10) and even no interaction at all (S01).

In both environments, the teacher's desk (L03) was primarily reserved for teacher-pupil communication (S11).

Class aisles and floors (L04) were more used in open-areas for group gatherings, especially groups including two sexes (S09). Aisles were the site for some teacher-pupil interaction (S11) in both environments.

Open-space pupils made contacts in the media-library center not only with peers of the same age (S02, S03) but also with younger children (S10).

There does appear to be some distinction between traditional schools and open-areas in terms of which social groups are found at particular locations. The null hypothesis of no difference in this respect should probably be rejected.

In summary, the data presented suggest that real differences do exist that distinguish pupil activity in open-space and regular classrooms. In open-areas, there seems to be less reading, less writing, less distracted off-task behavior, more attention to teacher or audio-visual presentations, more procedural and housekeeping activity, more travel, and more social interaction of all kinds.

A greater variety of locations are apparently used in open-space, including considerably greater occupation of the library, other classrooms, specialty rooms, and informally constructed sub-class areas. Aisles and floors were also employed more often, but not just for travel.

Trends in social setting indicate that in open-areas more pupil time is spent with peers, especially in groups of more than two, and especially with those of the same sex. Less individual contact with

the teacher seems to occur in open-space.

Some of the interactions among the three dimensions also seem to indicate differing patterns in the two environments. Among the interactions which apparently distinguished them were (a) locations at which certain behaviors occurred, (b) behaviors which were found at particular locations, (c) social settings associated with on-task social behaviors, (d) variety of locations for certain social settings, and (e) social settings characteristic of certain locations.

CHAPTER 6

RESULTS RELATED TO HYPOTHESES FROM THE LITERATURE

In Chapter 3, a number of hypotheses were generated from reports of research, or from statements of expectation, on the subject of open-area schools. The results discussed in Chapter 5 can now be related to these hypotheses in an attempt to confirm or contradict them. The basic data referred to, are presented in the Tables.

The procedure to be employed in each case is simply to note which categories of the present study apply, and to what degree, then to indicate the direction and extent to which the question may be resolved. For example, Hersom (1971), Hersom and MacKay (1971), and Ingalls (1969) all suggest that increased access to the media-library center occurs in open-area schools. Categories in the present study which directly apply to this suggestion are L14, L15, L16, and L17, all of which represent behavior observed in the specific location, "media-library center". The data of Table 4 show that in the present research, significantly more codings did occur in this setting in the open-area schools. Thus the expectation appears to be confirmed. However, another category, B06, which represents the pupil behavior of independently using audio-visual equipment, applies at least indirectly. When Table 1 is consulted, it is discovered that the present data do not support the suggestion, therefore some consensus must be arrived at. In the case of this particular proposition, the categories L14, L15, L16, and L17 appear to be more important as tests than B06. Consequently the final decision is that the hypothesis from the literature is confirmed, but

with a reservation. The reservation is that increased access to the media-library center does not necessarily imply that pupils will be able to independently use all media materials, including audio-visual equipment.

The hypotheses and tests to follow will not be presented in great detail. It will be considered sufficient to state the suggestion and its source, to note the applicable categories of the present study, and to state the consensus conclusion. The reader may refer to the appropriate Tables in order to view the pertinent data. Unless otherwise noted, it will be assumed that higher frequencies for open-area in the relevant categories will tend to confirm the hypothesis.

Allen (1972), Cheek (1970), Ellison et al. (1969), Hersom, and Ingalls propose that there is more constant and close teacher-student interaction in an open-space environment. Categories S11 through S21 (with a teacher) and L03 (at the teacher's desk) apply directly. The hypothesis is contradicted by the data of the present study which would confirm the contrary: that more pupil-teacher interaction occurs in traditional settings.

Ingalls and Kaelin (1970) assert that teachers share classes more often in open-space. Category S12 (with an "other" teacher) applies directly, and L10 and L11 (in another class area) apply indirectly. Open-area pupils do not appear to spend more time with other teachers than do their regular-class counterparts, even though they tend to wander more often into other class spaces. The hypothesis is neither confirmed nor contradicted by the present results.

Johnson (1970) and Kaelin report that more independent work and study occurs in open-area. Categories B01 and B02 (reads), B03 (writes),

and B06 (independently uses audio-visual equipment) apply directly, and higher frequencies in open-area would support the suggestion. Categories B04 and B05 (attends to presentations) apply directly, and lower frequencies in open-space would support the suggestion. Categories L14, L15, L16, and L17 (in the library) apply indirectly. This hypothesis is mostly contradicted by the present data which would tend to confirm the contrary: that more independent study occurs in traditional settings.

Anderson (1970), Cheek, Hersom and MacKay, Ingalls, Johnson, and Shaw (1971) propose that there is more interaction among pupils in open-space schools. Categories S02 through S10 (with a peer or peers) apply directly. L02 (at another pupil's desk) and B13, B14, B15, B16 (social behavior) apply indirectly. This hypothesis is confirmed.

It is indicated by Brunetti (1971), Halton County (1969), and Shaw that there is less misbehavior and boredom in open-area schools. Categories B12 (off-task distracted), B14, and B16 (off-task social behavior) apply at least indirectly. This hypothesis is confirmed by B12 and contradicted by B14 and B16. The present data apparently cannot resolve this question without further clarification, especially of the term "misbehavior", which was not specifically coded in this study.

Ellison et al., Johnson, MacPherson (1972), and Shaw suggest that more movement occurs in open-areas. Categories B10 (travel) and L02 through L22 (out of the assigned desk) apply directly. This hypothesis is confirmed.

Drew (1970) maintains that there is less physical, social, visual, and auditory protection in open-space, and consequently less privacy. Only category S01 (alone) applies to privacy, and only partially, since "alone" also includes being in a large class group. With this

reservation, the hypothesis tends to be confirmed. As far as the reference to increased sensory stimulation is concerned, B12 (distracted, withdrawn) applies indirectly. In this case, the hypothesis seems to be contradicted.

Chapman (1970), and Drew indicate that there is less spatial variety in open-area schools, and less use of peripheral space. Categories L10 through L22 (out of the assigned class area) apply directly. This hypothesis is contradicted.

That less large group instruction occurs in open-areas is reported by Allen and by Johnson. Categories B04 and B05 (attends to a presentation) apply directly. The hypothesis is contradicted, and the contrary, as reported by Ellison et al., is confirmed: there is more large group activity in open-space.

Burnham (1970) noted that more pupil questioning will be found in open-areas. Categories B07 (alters anonymity), L03 (at the teacher's desk), and S11 through S21 (with a teacher) apply at least indirectly and in general they contradict the hypothesis. The interaction of B13 (on-task active social interaction) with S11 (with the teacher) applies more directly, and also contradicts the hypothesis.

That learning will be relatively more active than passive in the open-area, is the opinion of Shaw. Categories B04 and B05 (attends to a presentation) apply directly, and lower frequencies in open-space would support the suggestion. Categories B01, B02, and B03 (reading and writing) might apply, but it is not clear whether they would be considered active or passive in Shaw's terms. It generally appears that this hypothesis should be rejected.

Hersom, Hersom and MacKay, and Johnson suggest that there is more

variation of class size in an open-area. Categories L12 and L13 (within an informally constructed sub-class space) apply indirectly, as do the interactions of B13 or B15 (on-task social behavior) with S07, S08, S09, and S21 (larger peer groups, or such groups plus a teacher). There is indirect evidence to support the hypothesis, but it is not completely confirmed.

Anderson, Drew, and EFL (1969) propose that increased involvement of parents or visitors is possible with less disruption in open-space. Category B17 applies directly. This is a measure of the degree to which the observers in this study disturbed or distracted the pupils. No difference in this aspect was found between the two environments. Also, no social codings for parents or visitors (except the observers) were ever made in either setting. This hypothesis appears to be contradicted.

Drew predicts less flexibility and mobility in open-area schools. Categories B10 (travel), B11 (manipulates the physical environment, and L02 through L22 (out of class desk) apply, and in all cases the data contradict the hypothesis.

Shaw expects more use of a learning center approach in open-space. Several categories apply, but only indirectly: B09 (miscellaneous on-task behavior), B10 (travel), L05 (at a class table), L08 (at a class shelf), and L12 or L13 (in a sub-class area). The consensus appears to be that the hypothesis cannot be confirmed. Informal observations support this conclusion.

More experimentation with space and furnishings in open-areas is anticipated by Anderson, Eberle (1969), Hersom, and Hersom and MacKay. Categories B11 (manipulates the physical environment) and L12 or L13 (in an informally constructed sub-class area) apply at least indirectly.

The present evidence tends to confirm this hypothesis.

Eberle, Hersom, and MacPherson suggest that team teaching is more common in open-areas. Only informal observation applies to this proposition, and tends to confirm it. (The present research does not distinguish team-teaching instructors from one another.)

Brunetti, Eberle, EFL, and Hersom refer to more activities and variety of learning materials in open-space schools. Categories B05 (attends to an audio-visual presentation), B09 (miscellaneous on-task behavior), B13 and B15 (on-task social interaction), and L02 through L22 (out of the assigned desk) apply. The consensus is that the hypothesis tends to be confirmed.

It is reported by Ellison et al. that less time is devoted to routine in open-areas. While clarification of what constitutes "routine" is necessary, it appears that at least category B08 (procedural or housekeeping activities) applies, and the data contradict the hypothesis and tend to confirm the contrary: more time is devoted to routine in open-space.

Finally, the Sudbury Board of Education (1972) notes no difference in the use of printed matter between the two types of school. In the present study, category B01 (reads a reference book or text) applies directly to this suggestion. The data contradict this hypothesis.

As noted in Chapter 3, certain expectations cannot be tested against the data of this study. This is the case because the present research was not concerned with teacher behavior, administrative organization, or affective and cognitive experience of pupils. Nevertheless, it should still be possible for many questions, "hypotheses from the reader", to be posed, translated into behavioral terms of reference, and analyzed

by a procedure exactly analogous to that employed in this chapter.

In summary, it appears that confirmation exists for the propositions that in open-area there is (a) more access to the library, (b) greater interaction among pupils, (c) more movement, (d) increased experimentation with space and furnishings, and (e) more various activity. Partial confirmation may be given to the assertions that (a) there is less boredom in open-space, (b) more variation in class sizes, and (c) more team-teaching.

Contradicted, are the hypotheses that in open-areas (a) teacher-pupil interaction is greater, (b) independent study is more frequent, (c) less large group instruction occurs, (d) more pupil questioning will be evident, (e) learning will be more active, (f) visitors will cause less disruption, (g) routines will be fewer, and (h) printed material will be used to the same extent as in regular-classes.

CHAPTER 7

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The results reported in Chapters 5 and 6 indicate that differences in pupil activity distinguish the open-area schools and traditional schools observed in this study. These differences are found along the dimensions of behavior, location for behavior, and social settings. Variation is also evident in the ways in which these three dimensions interact with one another. The results of the present study can also be applied to the analysis of questions posed by other researchers and commentators. Some of their findings and expectations have been confirmed or contradicted by the data presented here.

The most noteworthy findings of this investigation appear to be (a) that the academic behaviors of reading and writing are not as predominant in open-space as in regular-classes, (b) more procedural and housekeeping activity occurs in open-areas, (c) travel is more frequent in open-space schools, (d) social interaction with peers is more common in an open-area setting, especially in small groups, (e) contact with teachers is greater in traditional environments, (f) the media-library center is used more often in open-areas, and (g) less time is spent in desks in open-space schools and more activity occurs in peripheral locations.

The conclusion of this study is that the architectural design of schools does influence pupil behavior, and this effect can be directly observed and measured. Whether or not the reported differences are of a desirable character or not, must be decided in light of what

educational goals are considered important.

It seems likely that the specific results of this research can be generalized at least to other open-area and traditional schools in Edmonton. Application of the present findings to other grades and other subject areas cannot quite be direct. The tendencies toward more travel, more use of libraries, and more social interaction, will probably be the most widely characteristic features of open-space under various conditions.

The general implication of the discoveries reported here, is that somehow architectural space causes human behavior to be shaped in certain directions. The outcomes of this shaping process may be observed and compared, but ultimately the question must arise of how the physical environment functions in particular interactions with people. Information is needed about the various ways in which architectural variables act as stimuli or reinforcers for specific responses.

In the case of the school designs investigated in this study, several factors may be considered as possibly influencing the behaviors observed. Empirical research is recommended to explore each of these in more detail.

1. The absence of walls. The effects of altering this single variable seem to be complex and diverse. It is quite possible that most of the noted differences between the open-area and traditional settings could be speculatively accounted for on the basis of this change alone. For example, absence of walls may inhibit reading and writing behaviors in at least two ways: (a) by allowing an increased amount of distractive auditory and visual stimulation to reach a subject, and (b) by facilitating reinforcement of incompatible

activities, such as travel. Travel could perhaps be controlled by other means such as prohibition or discipline, but a more practical approach may be to allow limited movement or even encourage constructive travel to the library at certain times. Removal of walls would be expected to result in increased social interaction, again because more stimuli for this behavior become salient (usually about twice as many peers are visible in the open-area as compared to regular classes), and also because better access to travel paths increases the likelihood of establishing personal contact. It would also be interesting to explore the hypothesis that the added procedural activity observed in open-area schools is a general phenomenon, expressing a tendency for "destructured" space to require added structure and organization of behavior.

2. The presence of carpeting. It is perhaps unfortunate that no attempt was made to distinguish between "aisle" and "floor" in the present study. Informal observation confirmed that the floor was a common location for small groups of pupils. If a table and chairs are not available, a rug is quite a reasonable choice for such gatherings. Even entire classes were observed on the floor in open-areas. Carpeting may also contribute to the higher incidence of travel, which is more likely to be tolerated when it is not noisy.

3. The proximity and accessibility of the media-library center. In all open-areas observed, the library was centrally located and close to all class spaces. The saliency of this location is thus increased, and visits to the library can be made conveniently by a group or by individuals, who do not necessarily have to leave the sight of their teacher. (Noticeably, however, the overall incidence of reading was

actually lower in open-space.)

4. The scale of the space. Sheer size of open-areas probably has some effect on pupil responses. It might be speculated that more social contact is partly a reaction to the vastness of the surroundings.

5. Lengths of distances. Up to an undetermined limit, distance probably does not inhibit travel behavior. It may even reinforce movement as a brief interlude of peace and quiet between activities. Beyond a certain point, however, distances may discourage walking. It was informally observed in this study, for example, that only rarely did pupils travel more than half the diameter of an open-area, unless they had been asked to move to another part of the building entirely.

6. Color. Informal observation confirms that open-areas are more colorful. Although in most respects the average classroom and the average open-space teaching station are quite similar, and although very colorful traditional rooms exist, open-areas have more color as a whole for three probable reasons: (a) the carpeting, which is typically brighter than regular classroom linoleum, (b) the media-library center, where racks of books, extra decoration, and shelves or partitions, are visible, and (c) adjacent class spaces which add their own color to the overall scene. Color is probably a significant variable in the determination of behavioral or emotional response to a setting, but more investigation of this proposition is required. One speculation is that more variety or quantity of visual stimulation influences responses to social stimulation as well.

7. Lighting, temperature, and humidity. No doubt these factors are quite critical, but no data relating to them was even informally gathered in this study. No differences in these respects were noticed.

It may be that more is known about the effects of these variables than about most other environmental contingencies, and consequently, most buildings are alike in being at least acceptable in terms of biological comfort.

8. Windows. Windows were not formally distinguished from walls as locations in the present research. Nevertheless, it was noted that in regular classrooms, windows were usually more abundant, and closer to most pupils than in open-areas. Windows serve the function of lighting, and also allow extra visual stimulation into a room. This may be an undesirable distraction, or it may be a necessary component of a healthy environment. More research is required to resolve this question. In any case, more distracted behavior was observed in traditional schools.

9. The presence of dividers and partitions. The manner and extent to which the functions of a wall can be assumed by dividers of various kinds, requires investigation. Casual observation of the open-area setting suggests that even though partitions of some kind were employed in several locations, they were less effective as barriers than might be expected. Anything but a fairly complete and substantial system of floor-to-ceiling inclosure, appears to operate quite differently from regular walls. Visual stimulation is reduced, but a considerable amount of sound can pass, and many dividers are very easily travelled around.

Further research, in addition to exploring the roles of the variables just discussed, might address itself also to teacher behavior. A method similar to that employed in this investigation could be used. Simultaneous observation of pupils and teachers could probably be

accomplished by only slightly modifying the paper and pencil instrument, and adjusting the recording schedule.

If the procedures used here were to be applied by others to similar settings, a few modifications would be suggested: (a) the social category, S01, which was defined as "alone, or part of a large class group", should be broken into two separate categories, one expressing "alone and apart from the class group", and the other expressing "part of a large class group", (b) combining certain other categories, especially in the social dimension, might create a system with more generally manageable numbers of codes. Of course, special situations of interest must be represented, and the general principle should be retained that categories evolve to some extent from an inductive analysis of pilot data, and relate to the problem of concern. Also, (c) the observation schedule might be modified, since there does not appear to be any distinct advantage in the choice of 10-second intervals for 15-minutes for each subject, as far as a descriptive study is concerned. Where process or function is of interest, however, it is probably better to employ as short an interval as possible.

Three potential future developments in related research are seen as especially important:

1. Of highest priority should be the development of a coding instrument, categories, and procedure which would allow a functional analysis of the causal processes that involve the architectural and designed environment. As noted in Chapter 2, there seems to be potential in this regard in the recent work of John McLeish and Jack Martin at the University of Alberta. Ultimately, one would hope that such a procedure could be employed in real life settings, as events unfolded,

and that the technique could be used even by observers who were not highly trained psychologists.

2. Making observational systems straightforward enough and practical enough for general use by teachers, architects, and other professionals to whom psychology is at best a secondary interest, should be another objective of future work. At present, this goal is most likely to be achieved if the emphasis is placed upon gathering descriptive data. Presumably, realization of this aim would permit the psychologist to focus more time and attention on the task of interpreting such information and designing intervention procedures.

3. Finally, this method of "behavioral mapping" or its successors, might be applied in a variety of settings, such as museums, art galleries, parks, playgrounds, hospitals, residential developments, offices, or factories. Insight into exactly what goes on in these places is basic to implementing improvements.

In summary, it seems apparent that the ways and means exist to apply psychological techniques to the evaluation of human environments. The present research is one example of how this can be done.

TABLES

TABLE 1

FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS FOR
BEHAVIORS IN TWO SCHOOL TYPES

Behavior and Description	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
B01: reads a reference or text	1706	26.3	1331	20.5	46.30	***
B02: reads a notebook	664	10.2	522	8.1	17.00	***
B03: writes	991	15.3	825	12.7	15.17	***
B04: attends to a teacher	730	11.3	884	13.6	14.69	***
B05: attends to media	0	0	122	1.9	122.00	***
B06: uses media equipment	0	0	3	.05	3.00	NS
B07: alters anonymity	222	3.4	186	2.9	3.18	NS
B08: procedural activity	197	3.0	408	6.3	73.59	***
B09: miscellaneous on-task	121	1.9	78	1.2	9.29	**
B10: travel	191	2.9	262	4.0	11.13	***
B11: manipulates environment	0	0	11	0.2	11.00	***
B12: distracted, off-task	829	12.8	616	9.5	31.40	***
B13: on-task active social	146	2.3	275	4.2	39.53	***
B14: off-task active social	179	2.8	288	4.4	25.44	***
B15: on-task passive social	177	2.7	287	4.4	26.08	***
B16: off-task passive social	216	3.3	293	4.5	11.65	***
B17: looks at researchers	111	1.7	89	1.4	2.42	NS

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 2

SOME SELECTED COMBINATIONS OF THE DATA FROM TABLE 1 WITH
FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS

Behavior Combinations and Descriptions	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
B01 & B02: reading	2370	36.6	1853	28.6	63.29	***
B01 & B02 & B03: reading and writing	3361	51.9	2678	41.3	77.25	***
B12 & B17: distracted	940	14.5	705	10.9	33.57	***
B12 & B14 & B16 & B17: total off-task	1335	20.6	1286	19.8	.92	NS
B08 & B10: procedural and travel	388	6.0	670	10.3	76.16	***
B04 & B05: attending to a presentation	730	11.3	1006	15.5	43.88	***
B13 & B14: total "active" social	325	5.0	563	8.7	63.79	***
B15 & B16: total "passive" social	393	6.1	580	9.0	35.94	***
B13 & B15: total "on-task" social	323	5.0	562	8.7	64.54	***
B14 & B16: total "off-task" social	395	6.1	581	9.0	35.45	***
B13 & B14 & B15 & B16: total social	718	11.1	1143	17.6	97.06	***

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 3

FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS FOR
LOCATIONS IN TWO SCHOOL TYPES

Location and Description	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
L01: assigned class and desk	5818	89.8	4987	77.0	63.91	***
L02: assigned class, other desk	12	.2	115	1.8	83.54	***
L03: assigned class, teacher's desk	99	1.5	34	.5	31.77	***
L04: assigned class, aisle	290	4.5	599	9.2	107.4	***
L05: assigned class, table	14	.2	10	.2	.67	NS
L06: assigned class, blackboard	1	<.1	17	.3	14.22	***
L07: assigned class, wall	53	.8	53	.8	0	NS
L08: assigned class, shelf	24	.4	1	<.1	21.16	***
L09: assigned class, support area	11	.2	0	0	11.00	***
L10: other class, aisle	0	0	10	.2	10.00	**
L11: other class, table	0	0	88	1.4	88.00	***
L12: sub-class area, aisle	0	0	45	.7	45.00	***
L13: sub-class area, chair	0	0	42	.6	42.00	***
L14: library, librarian's desk	0	0	9	.1	9.00	**
L15: library, aisle	30	.5	148	2.3	78.23	***
L16: library, table	57	.9	91	1.4	7.81	**
L17: library, shelf	3	<.1	44	.7	35.77	***
L18: hall	4	<.1	4	<.1	0	NS
L19: restroom	0	0	3	<.1	3.00	NS
L20: specialty room, aisle	0	0	121	1.9	121.0	***
L21: specialty room, table	0	0	59	.9	59.00	***
L22: outdoors	64	1.0	0	0	64.00	***

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS p > .05
 * p < .05
 ** p < .01
 *** p < .001

TABLE 4

FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS FOR
LOCATION DATA IN TWO SCHOOL TYPES, REGROUPED INTO
MAJOR AREAS

Location and Description	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
L01 through L09: assigned class area	6322	97.6	5816	89.8	21.09	***
L10 & L11: other class area	0	0	98	1.5	98.00	***
L12 & L13: sub-class area	0	0	87	1.3	87.00	***
L14 & L15 & L16 & L17: library	90	1.4	292	4.5	106.8	***
L20 & L21: specialty room	0	0	180	2.8	180.0	***
L18: hall	4	<.1	4	<.1	0	NS
L19: restroom	0	0	3	<.1	3.00	NS
L22: outdoors	64	1.0	0	0	64.00	***

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 5

FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS FOR
LOCATION DATA IN TWO SCHOOL TYPES, REGROUPED INTO
SPECIFIC LOCATIONS

Location and Description	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
L01 & L02: at a desk	5830	90.0	5102	78.7	48.48	***
L03 & L14: teacher or librarian's desk	99	1.5	43	.7	22.09	***
L04 & L10 & L12 & L15 & L18 & L20: aisle or floor	324	5.0	927	14.3	290.7	***
L05 & L11 & L16 & L21: at a table	71	1.1	248	3.8	98.21	***
L06: at a blackboard	1	<.1	17	.3	14.22	***
L07: near a wall	53	.8	53	.8	0	NS
L08: shelf or cupboard	27	.4	45	.7	4.50	*
L09 & L19: at a support area	11	.2	3	<.1	4.57	*
L13: in a chair	0	0	42	.6	42.00	***
L22: outdoors	64	1.0	0	0	64.00	***

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 6

FREQUENCIES, PERCENTAGES, AND CHI-SQUARES COMPARISONS FOR
SOCIAL SETTINGS IN TWO SCHOOL TYPES

Social Setting and Description	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
S01: alone	5748	88.7	5307	81.9	17.59	***
S02: one same-sex peer	292	4.5	482	7.4	46.64	***
S03: one opposite-sex peer	143	2.2	67	1.0	27.50	***
S04: two same-sex peers	25	.4	78	1.2	23.31	***
S05: two opposite-sex peers	21	.3	8	.1	5.83	*
S06: two peers, male and female	7	.1	43	.7	25.92	***
S07: three or more same-sex peers	18	.3	85	1.3	43.58	***
S08: three or more opposite- sex peers	21	.3	2	<.1	15.70	***
S09: three or more peers, both sexes	2	<.1	136	2.1	128.1	***
S10: younger peer or peers	0	0	128	2.0	128.0	***
S11: assigned teacher	149	2.3	60	.9	37.90	***
S12: another teacher	0	0	2	<.1	2.00	NS
S13: teacher-aide or helper	0	0	3	<.1	3.00	NS
S14: librarian	0	0	9	.1	9.00	**
S15: teacher plus S02	4	.1	0	0	4.00	*
S16: teacher plus S03	3	<.1	0	0	3.00	NS
S17: teacher plus S04	1	<.1	8	.1	5.44	*
S18: teacher plus S05	3	<.1	0	0	3.00	NS
S19: teacher plus S06	1	<.1	0	0	1.00	NS
S20: teacher plus S07, S08, or S09	7	.1	2	<.1	2.78	NS
S21: teacher plus S10	0	0	3	<.1	3.00	NS
S22: administrator	2	<.1	0	0	2.00	NS

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 7

SOME SELECTED COMBINATIONS OF THE DATA FROM TABLE 6 WITH
FREQUENCIES, PERCENTAGES, AND CHI-SQUARE COMPARISONS

Social Combinations and Descriptions	School Type				CHI-SQ ^b	p ^c
	Traditional f ^a	%	Open-Area f	%		
S02 & S03: one peer	435	6.7	549	8.5	13.21	***
S04 & S05 & S06: two peers	53	.8	129	2.0	31.74	***
S07 & S08 & S09: three or more peers	41	.6	223	3.4	125.5	***
S02 through S09: same age peers	529	8.2	901	13.9	96.77	***
S02 through S10: total peers	529	8.2	1029	15.9	160.5	***
S11 & S12 & S13 & S14 & S22: adults	151	2.3	74	1.1	26.35	***
S15 through S21: teacher plus peers	19	.3	13	.2	1.13	NS
S02 & S04 & S07: same-sex peers	335	5.2	645	10.0	98.06	***
S03 & S05 & S08: opposite sex peers	185	2.9	77	1.2	44.52	***
S06 & S09: mixed sex groups	9	.1	179	2.8	153.7	***
S03 & S05 & S06 & S08 & S09: opposite sex included	194	3.0	256	4.0	8.54	**
S11 & S15 through S21: total with teacher	168	2.6	73	1.1	37.45	***

^a"f" is "frequency". The total number of observations is 6480 for each school type.

^bdf for all chi-square comparisons equals 1.

^cNS $p > .05$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 8
FREQUENCIES IN BEHAVIOR BY LOCATION INTERACTION CELLS
FOR TWO SCHOOL TYPES

Behavior and Location		Traditional	Open-Area
B01	L01	1681	1154
	L04	17	31
	L08	7	0
	L13	0	12
	L15	0	10
	L16	0	12
	L20	0	81
	L21	0	27
B02	L01	646	513
	L04	10	1
	L07	7	0
	L20	0	8
B03	L01	955	825
	L04	30	0
	L07	5	0
B04	L01	715	753
	L03	0	8
	L04	12	63
	L11	0	12
	L13	0	10
	L20	0	16
	L21	0	20
B05	L01	0	45
	L04	0	43
	L12	0	34
B07	L01	218	168
	L04	2	7
	L13	0	4
	L21	0	6
B08	L01	153	278
	L02	0	11
	L03	8	8
	L04	16	17
	L05	1	4
	L07	0	4
	L08	13	1

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 8 (Continued)

FREQUENCIES IN BEHAVIOR BY LOCATION INTERACTION CELLS
FOR TWO SCHOOL TYPES

Behavior and Location		Traditional	Open-Area
	L09	5	0
	L14	0	8
	L15	0	23
	L16	1	7
	L17	0	40
	L20	0	7
B09	L01	39	2
	L04	9	11
	L06	1	7
	L07	22	38
	L11	0	13
	L22	44	0
B10	L01	22	35
	L04	130	125
	L10	0	5
	L12	0	4
	L15	18	75
	L16	5	0
	L17	1	4
	L18	4	4
	L21	0	4
	L22	7	0
B11	L01	0	6
	L04	0	4
B12	L01	797	507
	L02	0	6
	L03	6	0
	L04	18	66
	L11	0	4
	L12	0	7
	L13	0	9
	L15	2	4
	L16	3	10
B13	L01	45	83
	L02	1	47
	L03	17	3
	L04	13	73
	L07	14	0

TABLE 8 (Continued)

FREQUENCIES IN BEHAVIOR BY LOCATION INTERACTION CELLS
FOR TWO SCHOOL TYPES

Behavior and Location		Traditional	Open-Area
B13	L11	0	31
	L15	8	7
	L16	37	27
	L22	8	0
B14	L01	152	242
	L02	8	3
	L04	18	26
	L07	1	3
	L15	0	4
	L16	0	4
B15	L01	91	66
	L02	0	44
	L03	59	13
	L04	8	94
	L06	0	6
	L11	0	28
	L15	1	14
	L16	9	20
	L22	4	0
B16	L01	195	244
	L02	1	4
	L03	3	1
	L04	7	23
	L05	9	0
	L07	0	5
	L15	0	7
	L16	0	5
B17	L01	109	66
	L04	0	15

TABLE 9

FREQUENCIES IN LOCATION BY BEHAVIOR INTERACTION CELLS
FOR TWO SCHOOL TYPES

Location and Behavior		Traditional	Open-Area
L01	B01	1681	1154
	B02	646	513
	B03	955	825
	B04	715	753
	B05	0	45
	B07	218	168
	B08	153	278
	B09	39	2
	B10	22	35
	B11	0	6
	B12	797	507
	B13	45	83
	B14	152	242
	B15	91	66
	B16	195	244
	B17	109	66
L02	B08	0	11
	B12	0	6
	B13	1	47
	B14	8	3
	B15	0	44
	B16	1	4
L03	B04	0	8
	B08	8	8
	B12	6	0
	B13	17	3
	B15	59	13
	B16	3	1
L04	B01	17	31
	B02	10	1
	B03	30	0
	B04	12	63
	B05	0	43
	B07	2	7
	B08	16	17
	B09	9	11
	B10	130	125
	B11	0	4

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 9 (Continued)

FREQUENCIES IN LOCATION BY BEHAVIOR INTERACTION CELLS
FOR TWO SCHOOL TYPES

Location and Behavior		Traditional	Open-Area
	B12	18	66
	B13	13	73
	B14	18	26
	B15	8	94
	B16	7	23
	B17	0	15
L05	B08	1	4
	B16	9	0
L06	B09	1	7
	B15	0	6
L07	B02	7	0
	B03	5	0
	B08	0	4
	B09	22	38
	B13	14	0
	B14	1	3
	B16	0	5
L08	B01	7	0
	B08	13	1
L09	B08	5	0
L10	B10	0	5
L11	B04	0	12
	B09	0	13
	B12	0	4
	B13	0	31
	B15	0	28
L12	B05	0	34
	B10	0	4
	B12	0	7
L13	B01	0	12
	B04	0	10
	B07	0	4
	B12	0	9

TABLE 9 (Continued)

FREQUENCIES IN LOCATION BY BEHAVIOR INTERACTION CELLS
FOR TWO SCHOOL TYPES

Location and Behavior		Traditional	Open-Area
L14	B08	0	8
L15	B01	0	10
	B08	0	23
	B10	18	75
	B12	2	4
	B13	8	7
	B14	0	4
	B15	1	14
	B16	0	7
L16	B01	0	12
	B08	1	7
	B10	5	0
	B12	3	10
	B13	37	27
	B14	0	4
	B15	9	20
	B16	0	5
L17	B08	0	40
	B10	1	4
L18	B10	4	4
L20	B01	0	81
	B02	0	8
	B04	0	16
	B08	0	7
L21	B01	0	27
	B04	0	20
	B07	0	6
	B10	0	4
L22	B09	44	0
	B10	7	0
	B13	8	0
	B15	4	0

TABLE 10

FREQUENCIES IN BEHAVIOR BY SOCIAL SETTING INTERACTION CELLS
FOR TWO SCHOOL TYPES

Behavior and Social		Traditional	Open-Area
B13	S02	48	58
	S03	17	11
	S04	6	14
	S05	14	0
	S06	2	15
	S07	0	14
	S08	16	0
	S09	1	45
	S10	0	86
	S11	41	19
	S14	0	5
	S17	0	4
B14	S02	106	210
	S03	54	24
	S04	11	23
	S07	2	14
	S09	0	7
	S11	1	6
B15	S02	34	38
	S03	6	3
	S04	2	3
	S06	2	27
	S07	7	50
	S09	0	74
	S10	0	40
	S11	107	35
	S14	0	4
	S17	0	4
	S20	4	1
B16	S02	104	176
	S03	66	29
	S04	6	38
	S05	5	8
	S07	9	7
	S09	1	10

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 11

FREQUENCIES IN SOCIAL SETTING BY BEHAVIOR INTERACTION CELLS
FOR TWO SCHOOL TYPES

Social and Behavior		Traditional	Open-Area
S01	B01	1705	1331
	B02	664	522
	B03	991	825
	B04	729	875
	B05	0	122
	B07	215	185
	B08	197	406
	B09	121	71
	B10	189	257
	B11	0	11
	B12	827	613
	B17	110	86
S02	B13	48	58
	B14	106	210
	B15	34	38
	B16	104	176
S03	B13	17	11
	B14	54	24
	B15	6	3
	B16	66	29
S04	B13	6	14
	B14	11	23
	B15	2	3
	B16	6	38
S05	B13	14	0
	B16	5	8
S06	B13	2	15
	B15	2	27
S07	B13	0	14
	B14	2	14
	B15	7	50
	B16	9	7
S08	B13	16	0
S09	B13	1	45

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 11 (Continued)

FREQUENCIES IN SOCIAL SETTING BY BEHAVIOR INTERACTION CELLS
FOR TWO SCHOOL TYPES

Social and Behavior		Traditional	Open-Area
	B14	0	7
	B15	0	74
	B16	1	10
S10	B13	0	86
	B15	0	40
S11	B13	41	19
	B14	1	6
	B15	107	35
S14	B13	0	5
	B15	0	4
S17	B13	0	4
	B15	0	4
S20	B15	4	1

TABLE 12

FREQUENCIES IN SOCIAL SETTING BY LOCATION INTERACTION
CELLS FOR TWO SCHOOL TYPES

Social and Location		Traditional	Open-Area
S01	L01	5346	4373
	L02	2	17
	L03	20	12
	L04	242	375
	L05	5	8
	L07	36	45
	L08	23	1
	L09	7	0
	L10	0	5
	L11	0	25
	L12	0	45
	L13	0	39
	L14	0	9
	L15	20	115
	L16	8	34
	L17	1	44
	L18	4	4
	L20	0	120
	L21	0	59
	L22	52	0
S02	L01	245	420
	L02	10	0
	L03	3	1
	L04	16	23
	L07	7	2
	L09	4	0
	L11	0	6
	L15	3	12
	L16	2	13
S03	L01	125	56
	L04	3	5
	L15	0	5
	L16	13	0
S04	L01	6	54
	L04	12	17
	L07	5	1
S05	L01	5	2
	L04	0	6

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 12 (Continued)

FREQUENCIES IN SOCIAL SETTING BY LOCATION INTERACTION
CELLS FOR TWO SCHOOL TYPES

Social and Location		Traditional	Open-Area
	L15	5	1
	L16	11	0
S06	L01	6	43
S07	L01	11	1
	L02	0	52
	L04	0	18
	L05	7	0
	L06	0	8
	L11	0	10
S08	L16	19	0
S09	L01	1	12
	L04	0	118
	L07	1	5
	L15	0	4
S10	L02	0	45
	L04	0	5
	L11	0	36
	L16	0	44
S11	L01	59	24
	L03	71	21
	L04	15	20
	L22	10	0
S14	L15	0	9
S15	L01	4	0
S17	L04	0	8
S20	L01	5	0
S21	L11	0	5

TABLE 13

FREQUENCIES IN LOCATION BY SOCIAL SETTING INTERACTION
CELLS FOR TWO SCHOOL TYPES

Location and Social		Traditional	Open-Area
L01	S01	5346	4373
	S02	245	420
	S03	125	56
	S04	6	54
	S05	5	2
	S06	6	43
	S07	11	1
	S09	1	12
	S11	59	24
	S15	4	0
	S20	5	0
L02	S01	2	17
	S02	10	0
	S07	0	52
	S10	0	45
L03	S01	20	12
	S02	3	1
	S11	71	21
L04	S01	242	375
	S02	16	23
	S03	3	5
	S04	12	17
	S05	0	6
	S07	0	18
	S09	0	118
	S10	0	5
	S11	15	20
	S17	0	8
L05	S01	5	8
	S07	7	0
L06	S07	0	8
L07	S01	36	45
	S02	7	2
	S04	5	1
	S09	1	5

Note: Where the total frequency in traditional plus open-area is 3 or less, the interaction cell has been omitted.

TABLE 13 (Continued)

FREQUENCIES IN LOCATION BY SOCIAL SETTING INTERACTION
CELLS FOR TWO SCHOOL TYPES

Location and Social		Traditional	Open-Area
L08	S01	23	1
L09	S01	7	0
	S02	4	0
L10	S01	0	5
L11	S01	0	25
	S02	0	6
	S07	0	10
	S10	0	36
	S21	0	5
L12	S01	0	45
L13	S01	0	39
L14	S01	0	9
L15	S01	20	115
	S02	3	12
	S03	0	5
	S05	5	1
	S09	0	4
	S14	0	9
L16	S01	8	34
	S02	2	13
	S03	13	0
	S05	11	0
	S08	19	0
	S10	0	44
L17	S01	1	44
L18	S01	4	4
L20	S01	0	120
L21	S01	0	59
L22	S01	52	0
	S11	10	0

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APPENDICES

APPENDIX A
THE RECORDING INSTRUMENT

APPENDIX A

THE RECORDING INSTRUMENT

On the following two pages are presented, in this order: (a) a sample of the recording instrument that was used to collect the data of this study, with added explanatory notes, and (b) a sample of a completed sheet as it would look just before key punching.

SCHOOL:	TYPE:	TEACHER:	ROOM:
CHILD:	SEX:	DATE:	TIME:
OBSERVER:			

[illegible]

APPENDIX B
THE PILOT STUDY

APPENDIX B

THE PILOT STUDY

Prior to the major investigation reported in this thesis, a pilot study was undertaken for the purposes of (a) testing the procedures proposed, and (b) accumulating data for the generation of behavior categories to be employed.

The observation schedule was very similar to that used in the main project. One recording was made every 10 seconds on an instantaneous time-sampling basis over a period of 20 minutes per subject. Six grade five children were observed in each of two schools during language arts. A total of 1440 bits of data were obtained.

The codes employed for location and social setting were the mnemonic letter codes described in Chapter 4. Behaviors were not coded, but written in longhand. Only objective, observable behavior was recorded. This was done as completely as time and space permitted.

Treatment of the pilot data essentially involved a process of tabulating frequencies and retabulating them when various behaviors were combined.

For the first frequency count, only exactly identical recordings were grouped. This list included approximately 250 individual entries with between 1 and 100 tallies in each.

The second count was obtained from the first by reviewing the 250 items and combining those which, while not literally identical, were identical in apparent meaning. For example, at this point "looks at speller" was included with "looks at spelling text", and "looks at dictionary" with "reads in dictionary". This reduced the number of entries to about 200, with frequencies ranging from 1 to 150.

The third list was generated by applying elementary rules of priority and saliency to the data. Each instance was reviewed, and where complex entries contained two or more elements, a decision was made as to which should be retained or discarded. For example, "looks at teacher and chews on pen" was combined with "looks at teacher". A general principle was established at this point to disregard the posture of the subject when the character of the most salient behavior was basically unaffected. This step reduced the number of categories to 106, each represented by 1 to 224 instances.

The fourth frequency count resulted when behaviors of a quite similar nature were amalgamated. For example, "looks at reference book", "looks at textbook", and "looks at dictionary" were classed together as "looks at a reference book or text", since, for the present purposes, there was no reason to distinguish them. It was during this stage that considerable attention was directed to the literature described in Chapter 4, in order to support the inductive process with established criteria of relevance and categorization. This fourth inventory included 53 entries, and tallies in each ranged from 1 to 270.

A fifth cataloguing was performed to reduce the number of categories to 25, with frequencies between 2 and 294. The rules by which combining was done were (a) categories with very low representation were to be avoided if possible, (b) relevance to the present study was to be a critical factor, and (c) where more general labels accurately reflected many particulars without loss of key information, such labels should be used. An example of a merger at this stage is the inclusion of both "talking to (someone)" and "writing a note to (someone)" into a class of "active social interaction".

The sixth frequency count actually represented the final system of 17 behavior categories as defined in Chapter 4. It was decided that further grouping would result in an unacceptable reduction of discriminative power.

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